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ENGINEERING AND MINING JOURNAL-PRESS

A CONSOLIDATION OF ENGINEERING AND MINING JOURNAL AND MINING AND SCIENTIFIC PRESS

A Proposed Mining Method
By G. Townsend Harley

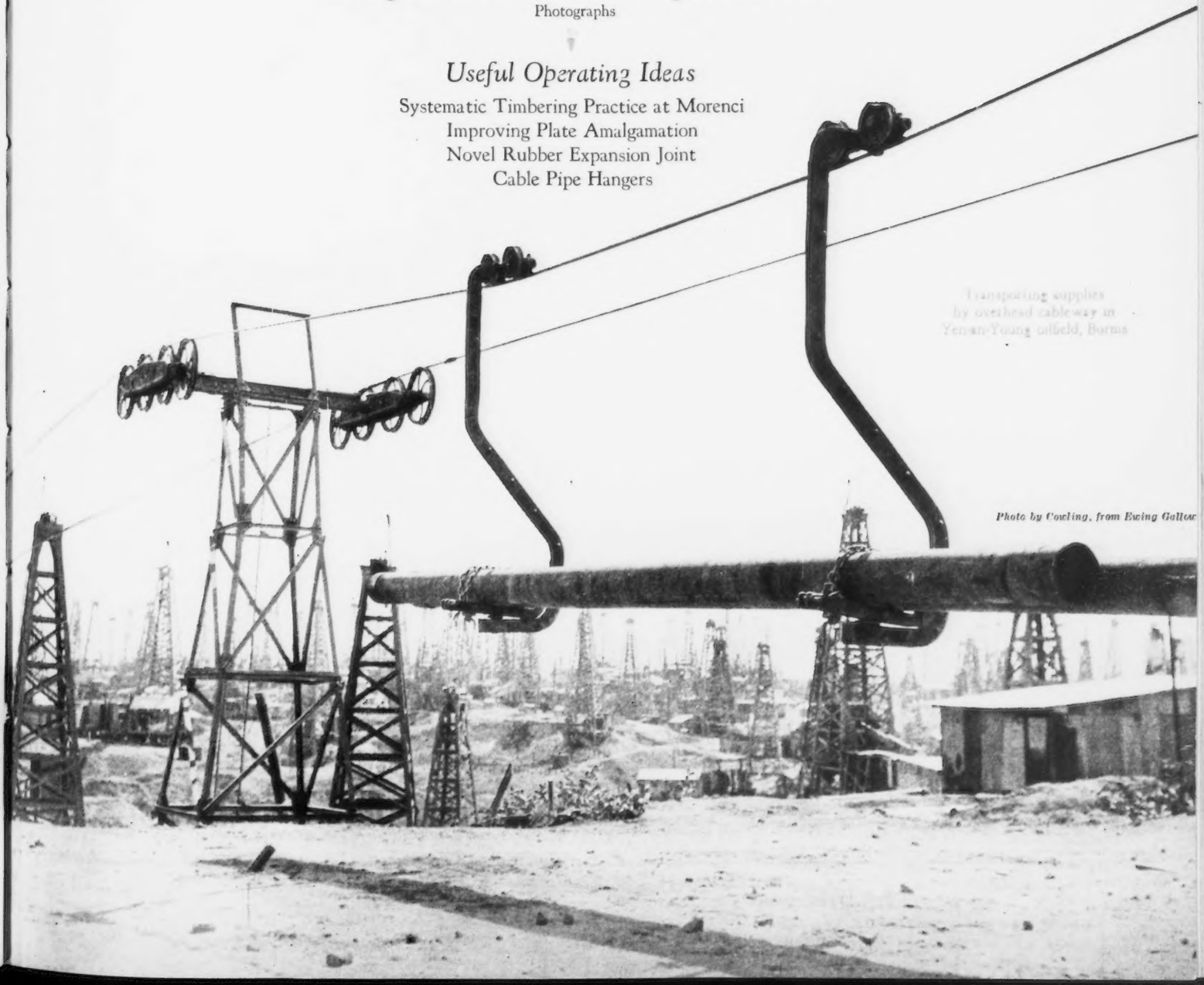
Russian Asbestos Industry Reviving
By Leo Berlinraut

Injected Copper Sulphides
By Graham John Mitchell

Mining Oil in the Yen-an-Young Field, Burma
Photographs

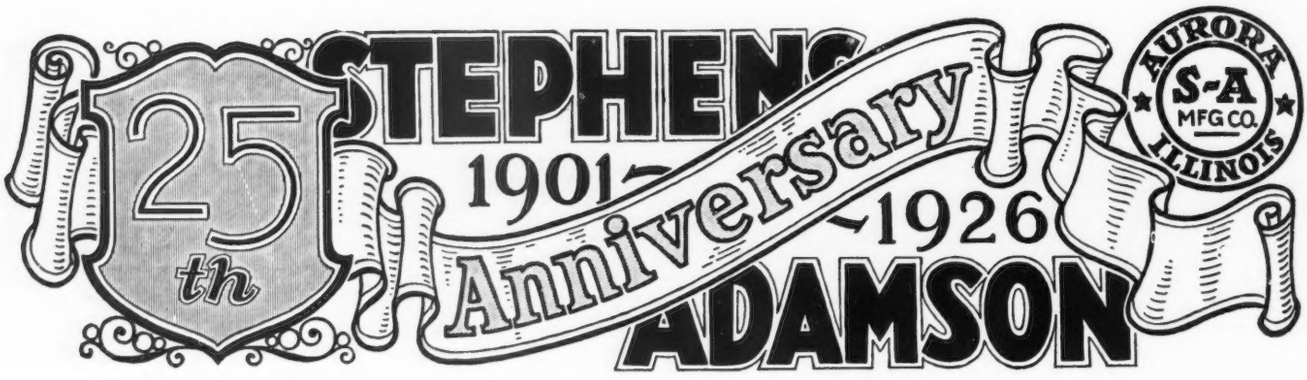
Useful Operating Ideas

Systematic Timbering Practice at Morenci
Improving Plate Amalgamation
Novel Rubber Expansion Joint
Cable Pipe Hangers



Transporting supplies by overhead cableway in Yenan-Young oilfield, Burma

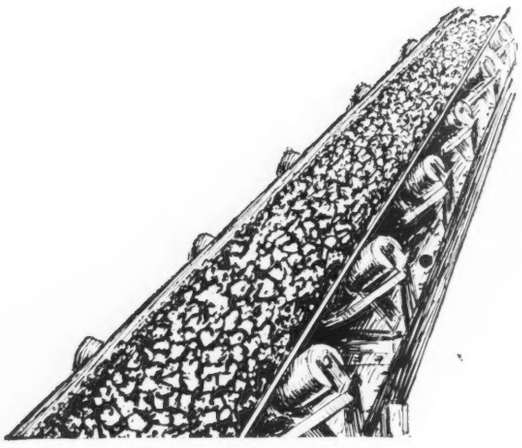
Photo by Cowling, from Ewing Gallo



THE MARCH OF THE S-A BELT CONVEYOR

Belt conveyors easily retain their outstanding leadership when it comes to transporting large tonnages of bulk materials for long distances.

These conveyors are not limited to horizontal installations but may be operated up or down inclines, ranging sometimes as high as 20 degrees from the horizontal. Where originally the first conveyors were narrow and operated at slow speeds, the present belts are furnished up to 60 inches in width and are operated at high speeds in many cases to carry very large capacities.



Several important installations of 1925 have definitely established the economies of long distance belt conveyor transportation.

STEPHENS-ADAMSON MFG. CO.
AURORA, ILLINOIS
LOS ANGELES, CAL.

STEPHENS-ADAMSON
S-A BELT CONVEYORS

Volume 121 January 23, 1926 *Number* 4

ENGINEERING AND
MINING JOURNAL-PRESS

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What the Automobile Industry Means to Mining

IN 1925 more automobiles were sold than in any single year in the history of the industry.

PROMINENT automobile manufacturers gathered in New York City last week for the Annual Show at the Grand Central Palace. Of the many interviews given out by these men not one failed to predict that automobile sales would be greater this year than in 1925.

MOST of the automobile manufacturers reported orders on hand sufficient to keep their factories operating at capacity for months.

THIS is of interest to mining men because automobiles are made principally of metal of some kind, and as more automobiles are manufactured more metal must be produced.

JUST an added reason why 1926 looms big for the mining industry and why mining activities will continue to increase.

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JOSIAH EDWARD SPURR, Editor

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The Mining Journal-Press

Engineering and Mining Journal-Press is a consolidation of *Engineering and Mining Journal* and *Mining and Scientific Press*, effective April 1, 1922.

Engineering and Mining Journal was founded in 1866 as the *American Journal of Mining*, with George Francis Dawson as Editor. In 1869 the name was changed to *Engineering and Mining Journal.*

Publications which have been absorbed are: 1875, *Coal and Iron Record;* 1877, *The Mining Review* (Denver); 1879, *The Polytechnic Review;* 1902, *Mining and Metallurgy;* 1906, *Mining Magazine;* 1917, *Engineering and Mining World.* The successive editors have been Rossiter W. Raymond, Richard P. Rothwell, Fred Hobart, David T. Day, T. A. Rickard, and W. R. Ingalls. In 1919 J. E. Spurr became Editor.

The Mining and Scientific Press was established in 1860 as the *Scientific Press.* Three years later "Mining" was added to the title. The successive editors have been Almond D. Hodges, Charles G. Yale, J. F. Holloran, and T. A. Rickard.

The staff of the *Engineering and Mining Journal-Press* consists of J. E. Spurr, Editor-in-Chief; T. A. Rickard, Contributing Editor, San Francisco, Calif.; George J. Young, Associate Editor, San Francisco, Calif.; A. H. Hubbell, Managing Editor; E. H. Robie, A. B. Parsons, A. H. Fay, W. N. P. Reed, Assistant Editors.

The Right to Restrict Output

ECONOMIC WAR has been declared by Secretary Hoover against those foreign governments who are controlling the supply and prices of foreign products (which he specifies as rubber, cotton, camphor, coffee, iodine, nitrates, potash, mercury, and sisal), diplomatic remonstrances having failed. What the Secretary objects to is the intrusion of the governments into these monopolies; and the fixing of the price and distribution so as to give a maximum profit to the producing government, a procedure which he says has been developed in recent years and is a revival of medieval expedients.

The idea, however, is not of such recent growth as is suggested. The control by the Chilean government of the price of nitrates, through an export tax, for example, is of long standing. Also the control and distribution of German products by cartels or consortiums was one of the state-recognized and state-aided commercial devices of pre-war Germany; and these organizations, in some cases, became international. The price of quicksilver was closely controlled for many years previous to the war, by England, or at least by English capitalists, as was the price of potash by Germany. The development is therefore of slow growth, and is, indeed, the result of natural industrial evolution. Unhappy though one may be to pay exorbitant prices for golf balls and automobile tires, conveyor belts and overshoes, one must recognize the logic of the development and even have a sporting appreciation of the hand being played by those more or less war-bankrupt nations which are "holding up" the United States and the rest of their world customers.

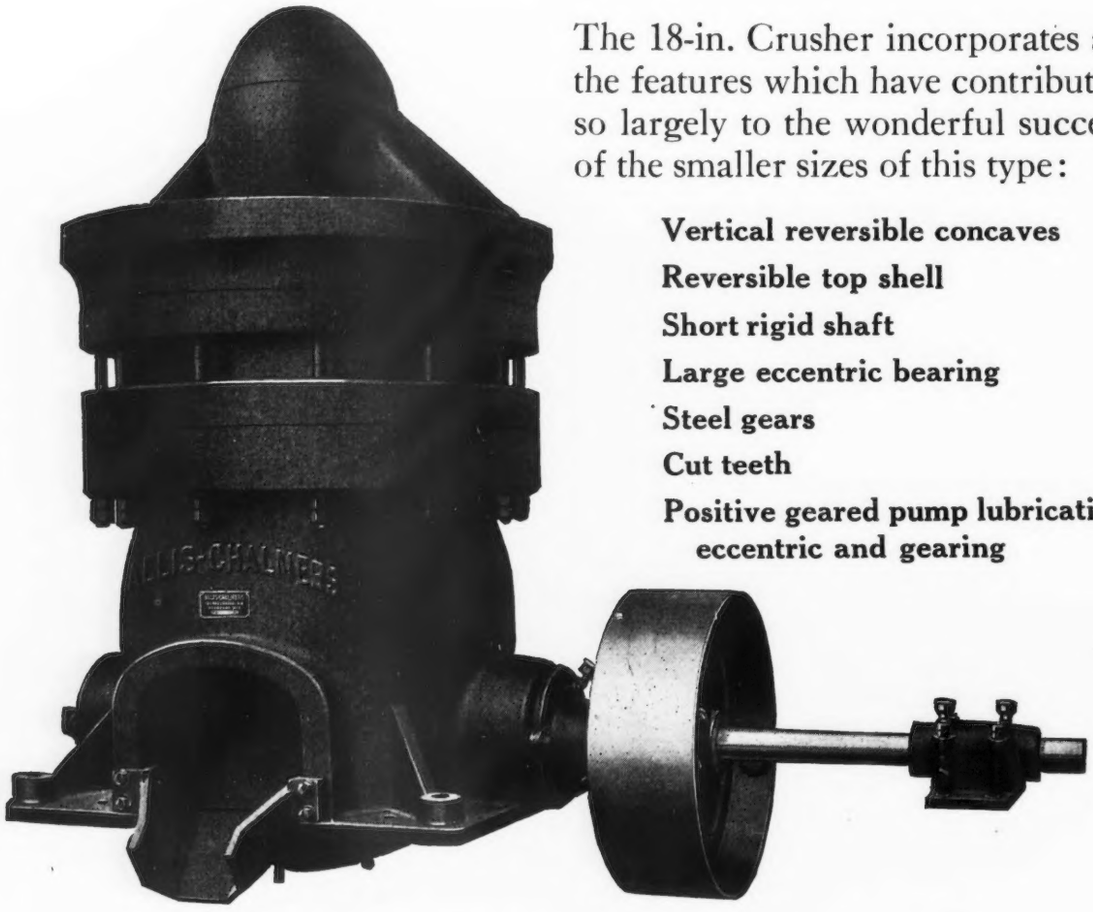
The principle of economic and trade discrimination by the United States against its comrades in the world galaxy of nations is one to which Mr. Hoover, as an officer of the Republican administration, is committed, in the form of the protective tariff, which does not hesitate to impose trade barriers against any country, and shut out any product whose importation is not desired by American producers, without any regard whatever for the feelings and the economic welfare of the nation affected, and in spite of the fact that the prices of commodities to American producers are thus artificially and governmentally raised. Further, the Webb act provides that American exporters may form a combination immune from the provisions of the Sherman anti-trust law against similar internal combinations, and may form a monopoly if they can, and fix prices and limit supplies if they can. As a result of this, Europe, during the activity of the Copper Export Association, it is rumored, had to pay an average higher price for American copper than did those at home.

But the progress of modern business toward consolidation, output control, and indirect or direct price fixing has been steady for several years in this country as well as abroad; and in so far as government does not disapprove of such development it is essentially taking a hand in it. It seems probable that the Aluminum Company of America, controlled by Mr. Mellon, Secretary of the Treasury, fixes the price of aluminum, here and abroad; and American or international control of the output and price of other commodities, like sulphur, is probable. In times past there has probably been a designedly though temporarily limited output of American copper — which *Engineering and Mining Journal-Press* has urged; and the zinc producers of the Tri-State district have limited their output of zinc ore, and so helped to raise the price of zinc. The only hope for the asbestos industry of Canada, in competition with South African asbestos, would appear to be a combination to control output and price—which *Mining Journal-Press* has suggested.

There are other foreign monopolies besides those which Mr. Hoover mentions. The diamond monopoly is closely regulated, and the price of diamonds is artificially upheld at a quite unjustified figure; and uncounted millions of American money flow annually into British and Belgian pockets through this highly organized cartel. A smaller example is the price of cobalt, artificially upheld by Canadian producers; another the price of bismuth, controlled by a London company. Indeed, a study of the articles whose prices are held up by combinations to reduce output would fill one or more volumes. Moreover, the American farmers are advised by the present government to control their output, carefully distribute their marketing, and so artificially uphold prices, just as the fruit growers of California have long ago learned to do.

New 18-Inch Superior McCully Fine Reduction Gyratory Crusher

The latest development in the Superior McCully Fine Reduction line, furnished to a large Cement Company —having two feed openings, each 18 in. by 68 in.— capable of taking the product from the largest size primary crushers—capacity with minimum discharge opening of 2½ in.—225 to 275 tons per hour.



The 18-in. Crusher incorporates all the features which have contributed so largely to the wonderful success of the smaller sizes of this type:

Vertical reversible concaves
Reversible top shell
Short rigid shaft
Large eccentric bearing
Steel gears
Cut teeth
Positive geared pump lubricating eccentric and gearing

ALLIS-CHALMERS
MILWAUKEE, WIS. U.S.A.

to have paid the former editor, John Hogan, a commission on every purchase of Fortuna stock.

The publicity follows soon after the advertisements which Rice has obtained through the criticisms of his Idaho Copper flotation, by the State Mine Inspector of Idaho, and the evidence that he had conducted wash sales in this stock on the New York Curb, a practice, by the way, that is by far not confined to the mining stocks which Rice manipulates. Rice has an india-rubber capacity for bouncing back, and a recognized ability for finding people who will take part in his schemes. Noteworthy in this direction was his recent engagement of a manager of the Idaho Copper properties. Such an alliance, however, will not whitewash the record of George Graham Rice. Indeed, it is greatly to be regretted as having the opposite effect on the reputation of the manager, who has long been recognized as a geologist of ability.

Low-Grade Vs. High-Grade

A CORRESPONDENT signing himself "Respectfully, Curious," who read on the consultation page of *Mining Journal-Press* of Jan. 2 about the low-cost mining of lean ores of gold at Juneau, in Alaska; of silver at Fresnillo, in Mexico; of copper at Bingham, in Utah; of lead at Flat River, in Missouri; and of zinc at Mascot, in Tennessee, writes asking for answers to the following not uninteresting even if satirical questions:

"1. What mines have the highest cost per ton for mining and treatment in producing the same metals?

"2. Why are their costs so much higher than those named by you?

"3. Do you think that if the managers and executives of the mines mentioned by you would change with those having high costs, that the position of costs would be reversed?

"4. Does a manager who makes a reputation, in charge of a mine that is so rich that it is fool-proof, ever make a reputation afterwards upon a mine that requires real management?"

Suppose the questions be answered seriatim:

1. It would be impossible to name the companies which "have the highest cost per ton for mining and treatment." Of the thousands of producing mines in the world, or even in North America, only a comparative few publish understandable cost figures, and those with the highest costs are not among these.

2. The aim of any mine manager is, or should be, to produce an ounce of silver or a pound of lead at the lowest possible cost, not to treat a ton of ore at the lowest possible cost. However, "Curious" is talking about cost per ton. The answer is that the ore deposits are different in size, shape, and disposition in the crust of the earth; that the ores are different in physical, mineralogical, and chemical characteristics; that conditions of weather, labor supply, transportation are different. Dozens of other conditions may be less favorable. And, to concede a point to the notion that apparently is in the back of our correspondent's head, the management may be less proficient.

3. The men in charge of the operations mentioned are, by and large, able men—probably among the best; but there are others who are ust as well qualified. The fact that these others happen to be running mines that are not so low in grade has nothing to do with their ability. Just as much, or more, good management may be required to make a profit on an ore containing twenty ounces of silver as on one containing only five ounces. And there is no sound reason for saying arbitrarily that, because one set of men is doing well with a low-grade mine, another set could not do even better.

4. One of the low-grade mines mentioned in the article that aroused our friend's interest is, at the present time, one of the most nearly fool-proof enterprises in the world. With prevailing lead prices, it would be almost impossible for a manager of reasonable intelligence to make a losing proposition of this property, which is the generally accepted idea of a fool-proof mine. But the inference that every man who has managed a fool-proof mine depended upon its fool-proofness "to make a reputation" is a mistake. Undeserved credit for being a good manager has been given to men who were lucky in being in charge of mines that could stand inefficient management; and on the other hand, men who have won recognition at highly profitable mines afterward have added to their prestige by making much less money, or none at all, at other properties.

The purpose of mining is to make money, and it is natural for the staff of a mine where the balance sheet is regularly in the "red" to put its best efforts into its work; possibly they strive harder than they would under more comfortable financial circumstances. But "Curious" is wrong if he thinks that high-grade ore means that money making is easy and that low-grade ore always "requires real management."

The Most Powerful Machine in the World

SUPERLATIVES are always interesting, particularly, it is said, to Americans, who are more or less proud of their tallest skyscrapers, fastest long-distance trains, cheapest automobiles, and weakest liquor. Those who listened to the New York Edison hour on the radio the other night already know that America can also boast of the most powerful machine in the world, but it is doubtful if many engineers, without a little serious thinking, could even make a good guess as to what class of apparatus the one so described is included. One is tempted to beg the question by asking what is meant by "most powerful." The mind reverts, perhaps, to the steam shovels which dug the Panama Canal, to the rugged machines employed in rolling mills, to the powerful compound locomotives that pull long freight trains over the mountains, to the big Diesel engines that drive ships, or to other examples of the application or production of power in large amounts that come within the range of one's personal experience. And yet, according to Arthur Williams, of the New York Edison Co., the most powerful machine in the world comes under none of these groups.

Assuming that the reader has, by this time, given up, the answer may be supplied in the enormous turbo-generators that are now being installed in the electric plant at 14th St. and the East River, New York City. One of these power units weighs over 1,000,000 lb., is 50 ft. high, and furnishes 80,000 hp. of electrical energy. Steam from the burning of thirty tons of coal per hour is required to drive it. Single parts weigh as much as 200 tons. It is more efficient than any other generator heretofore designed, and one unit would have supplied the entire city of New York with electricity in 1906. Steel and copper are, of course, the principal materials used in building it. It is in such outlets that the present record-breaking production of copper is going.

We wish Secretary Hoover luck in reducing the price of rubber tires and potash fertilizers, but as a nation the United States might be put, in the eyes of the world, in a more judicial, not to say sportsmanlike, attitude. The Secretary, in effect, denies the doctrine that any nation has the right to sell what it produces in any way or for any price it can get; and in denying that doctrine he, in effect, promulgates a new doctrine, that the special products of special regions are in effect the common property of the world, which may absorb them freely and without artificial economic barriers. This is a doctrine which may be argued, but as yet is rarely heard and is certainly not popularly grasped and accepted. It is something that the United States may argue at the World Court after she becomes a nation fully represented at this, and perhaps the League of Nations. It is well to bring the whole matter into the open and to argue it from all sides; for the American attitude at the moment is indeed like the attitude of other dominant nations in the past.

Gold-Quartz Veindikes in Venezuela

THE GOLD-QUARTZ VEINS of Venezuela are of the same common type as those of Canada, the Appalachian region of the United States, California, Alaska, Australia, Guiana, and many other portions of the globe, according to a recent article by Dr. Edmond Bernet, published in *Le Génie Civil* at Paris.

Dr. Bernet writes, as translated:

The auriferous quartz veins belong to the type which is called "veindikes." Their origin is due to the extreme stage of differentiation of a deep-seated granite magma injected into schists along planes of least resistance, in fractures or fissures produced by organic movements. The gold, whose source is intimately associated with the granitic magma, has concentrated in the quartz veins, which are the extreme form of the product of magmatic differentiation.

Dr. Bernet divides these veins into three classes: 1, veins of massive quartz originating from the filling of largely open fractures in compact rocks; 2, veins formed of bands of auriferous quartz alternating with schists; 3, auriferous schists, more or less quartzose, originating in injection of zones of slight resistance. There is no fundamental difference in the tenor of gold ore in these different types of veins.

The deep-seated gold-quartz vein, it is necessary to repeat many times before the conception is grasped in all parts of the scientific world, is a definite magmatic type of uniform appearance and widespread occurrence. It is as definite a magmatic type as the granitic pegmatite, of which indeed it is simply a variant.

Investors' View of Mining in 1926

HOW does the investing public view the prosperity of the mining industries for the coming year? It is commonly accepted that security prices discount conditions in the business world for several months ahead, but expected future conditions do not entirely govern the price of a stock—accumulated earnings and the possibility of increased dividends therefrom also have an important bearing. Stock prices in general at the beginning of 1926 were much higher than in January, 1925, and yet business men do not foresee much brighter prospects now than they did a year ago. But a year of prosperity has added a substantial amount to the intrinsic values of securities.

In the annual review number of *Mining Journal-Press*—the issue of Jan. 16, 1926—was published the usual tabulation of mining stock prices during the last year, and for the first time the net change for the year was also included. Of fifty-two copper companies, the share quotations of forty-one were less on Dec. 31, 1925, than on the same date of 1924, only eleven being quoted higher. This does not indicate much optimism by investors as to a marked improvement in the copper market, and, compared with the prices of industrial securities, shows a marked aversion to invest in the stocks of copper producers as a group. Quite a different story is exhibited by the lead and silver-lead groups, in which seventeen stocks show an increase and only seven declined, though the price of lead was 9¼c. at the end of 1925, compared with 9.70c. a year before. Apparently no serious reaction is expected to affect this group. Gold mines also seem to be well considered, for of twenty-five companies, the shares of nineteen advanced during the year. The continued favorable development of the northern Ontario mines helped this group. In the straight silver group, the shares of seven companies advanced and those of five declined, and of the iron and steel companies, nine were considered more valuable and eight less so. All the shares of the specialty group, embracing asbestos, sulphur, vanadium, diamonds and platinum, advanced, and of the mining, smelting, and refining companies advances were registered in seven out of the eight companies in the group. Plainly, custom smelters are expected to do well.

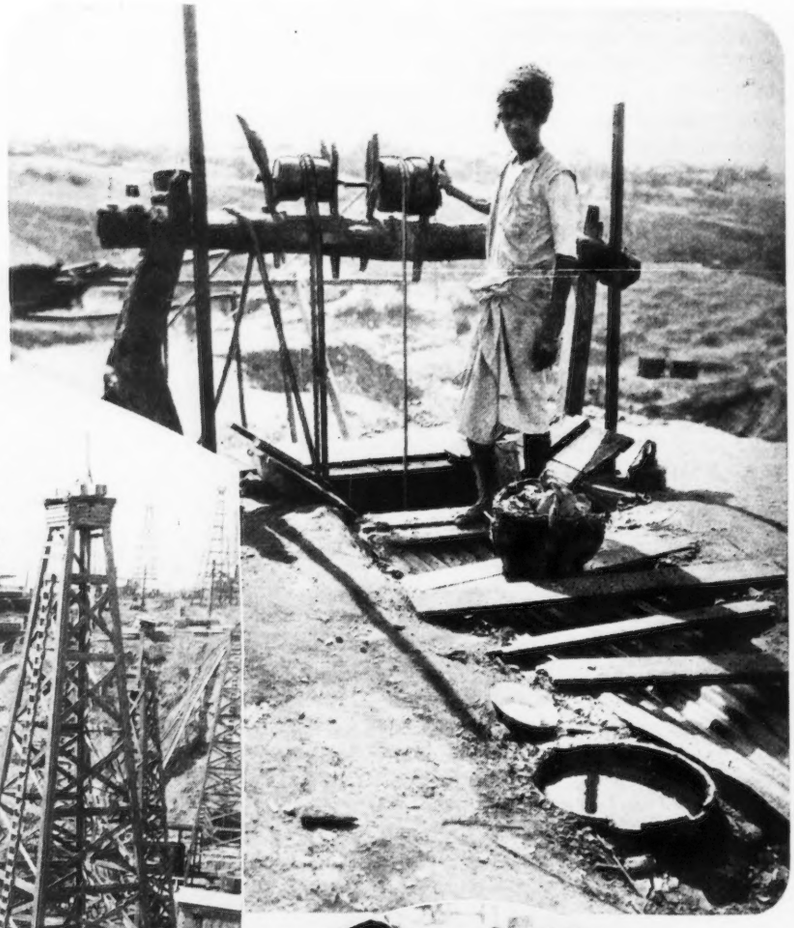
Copper companies, therefore, are the only ones in which the investing public is disappointed; it has hoped for fancy prices too long and too many interviews have been printed in which some president or chairman says that European demand must soon be enormous, that domestic demand is unprecedented, that stocks are insignificant, and that higher prices must of necessity result within the next six weeks. "The price should be firmly at the 15c. level in thirty days," is a favorite observation. And yet the fireworks never explode. Rather do the large companies seem satisfied to turn out the biggest tonnage of copper that the world has yet seen produced, at prices which show little variation from the present level, prices which are low and yet allow most of them to pay good dividends, owing to the large scale of operations and to improved methods of mining and metallurgy.

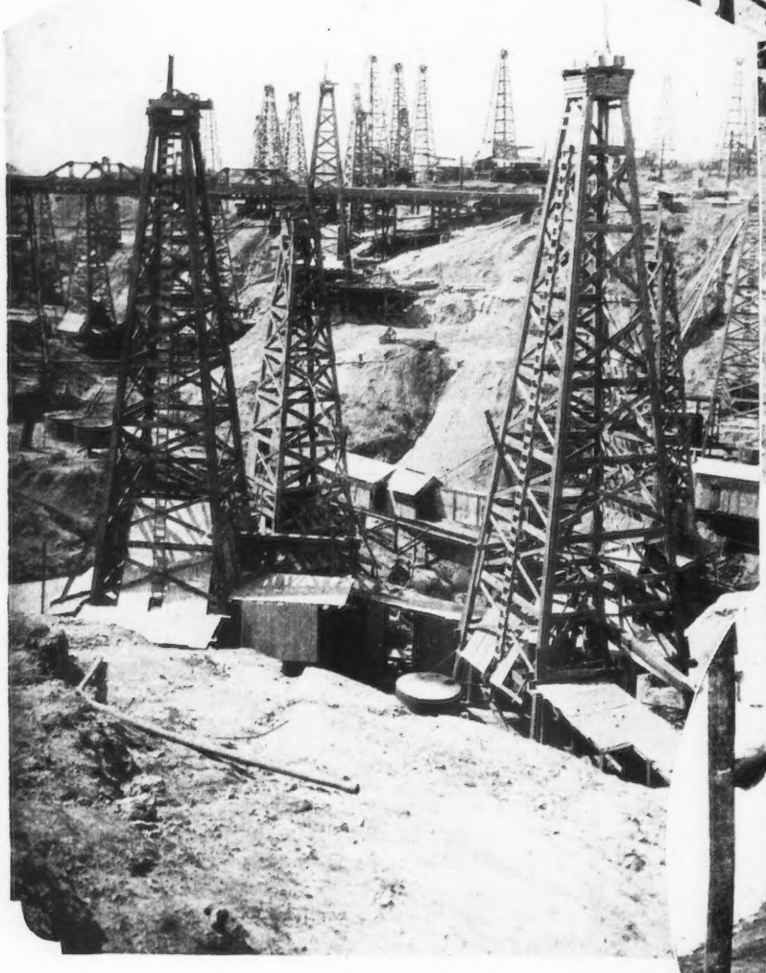
The Irrepressible Rice

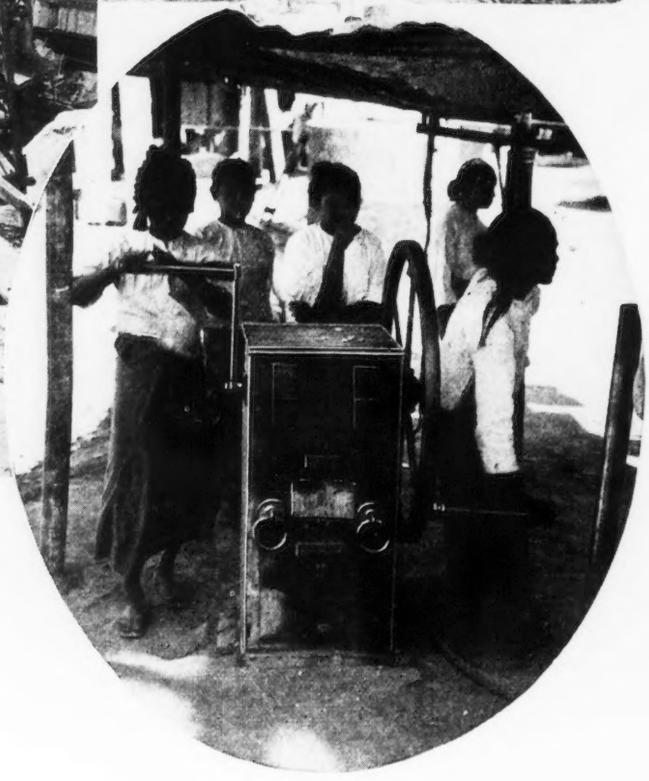
THE FIGURE of George Graham Rice, né Jacob Simon Herzig, bobs up in the newspapers with the persistence of the negro's head which is the target for baseballs at the county fair. And Rice's figure always bobs up in precisely the same rôle, as charged with being a careless manipulator of mining stocks; although the name of these stocks varies continually. Rice, with six others, has now been indicted by the Federal Grand Jury on the charge of using the mails to defraud in connection with the sale of stock of the Fortuna Consolidated Mining Co., of which company we have no knowledge. The stock was kited on the curb to 74, largely, the government charges, because Rice boosted it in a publication called "Facts and Fakes of Wall Street," through writings for which Rice is alleged

In the Yen-an-young Oil Field, Burma

Ancient ways of mining petroleum and the most up-to-date methods of drilling are found side by side in the region along the Irawaddy River between Rangoon and Mandalay. In between the holdings of the Burma Oil Co. are small areas that the natives are allowed to work







Above—Some of the wells of the Burma Oil Co. Upper right—A native well. Some of these are said to be over 300 ft. in depth. The oil is raised in buckets. Hoisting and all other operations are done by hand. Digging is done by reflected light. Oval—Burmese women running a pump which forces fresh air down an open well

Left—The hoisting engine at a native oil well. Note the manner of attaching the rope to the "drums." In the background is a modern derrick

Right—Three of the oil well workers. The man on the left is one of the native diggers. Shifts are changed frequently because of the difficulty of the work and the odor of the oil, despite the fact that air is pumped down constantly from the surface

Left—"Headframe and sheave" at one of the shafts or wells. Women enjoy equal rights with men, as may be seen from this picture. All photographs are by Cowling from Ewing Galloway

A Proposed Mining Method

Inclined Top Slicing With Scraping in Wide Veins

Greater Use of the Scraper Has Been Delayed, Owing Chiefly to the Character of the Working Places—Changing Conditions Demand New Practices

By G. Townsend Harley
Morenci, Arizona

NO SINGLE ELEMENT of the following proposed method of mining is new or untried, but the particular combination of elements is, I think, original and would merit a thorough trial in some of the wide-vein orebodies now being mined by other methods in which the cost of development per ton of ore extracted is high. To adopt a basis for this discussion, I have assumed a vein in which working conditions are about as hard as will ordinarily be found, and have attempted briefly to describe one of the present mining methods which involves about the average amount of preliminary development work and which, from the point of view of cost and efficiency, would be well adapted to such a vein.

Deep-vein mining is difficult work in that for each new level opened up and developed only a relatively small tonnage is made available; water, heat, and bad air are important factors; haulage costs are likely to be high; and hoisting costs likewise, and constantly becoming higher with increasing depth. A mine that increases in depth is facing, therefore, three major problems—namely, a decreasing available tonnage on each level developed, a decreasing grade of ore, and the probability of an increasing cost per ton for operation. Although the actual cost of stope development and stoping is only a small part of the total cost in a mine of this type, yet if, by adopting new methods, the amount of development work can be reduced by a quarter or a third, and at the same time the stoping efficiency can be increased and stoping costs can be reduced, it is well worth while to consider the application of such methods to particular problems in an effort to offset the natural and inevitable tendencies inherent in deep-vein mining.

A Hypothetical Case—Vein Conditions Assumed

A vein is assumed of from 20 to 40 ft. or more in width, having any dip from 35 or 40 deg. to the vertical. Orebodies in the vein are 100 ft. or more in length, and in many places they are continuous for several hundred feet along the strike; they are of considerable height, usually extending along the dip of the vein for from 100 to several hundred feet. In the orebodies, the full width of the vein is of minable grade, and no sorting is required. In not a few places values extend into the footwall or hanging wall and are to be removed. The vein matter is heavy with sulphide, which oxidizes readily and generates excessive heat. Occasionally small amounts of water, not exceeding 4 to 10 gal. per minute for any one stoping area, are encountered. This water is usually hot and saturates the already heated air, making conditions very poor in the stopes, even though a fair general ventilation system is maintained. The walls of the vein are of such a nature, fractured and heavy, that shrinkage or caving methods are not applicable, on account of excessive dilution of the ore with wall rock. The ore itself is generally soft, although in places it may become harder and blocky. It is well suited throughout for square-setting and top-slicing methods.

The Usual Methods in Such a Case

In extracting ore from a wide vein of any great length, if the ground in or near the vein is at all heavy, the permanent haulage road must be carried along parallel to the vein and at a safe distance from it, so as to minimize repair work and provide a safe opening for men and equipment. A parallel haulage road necessitates crosscuts to the vein at longer or shorter intervals, dependent upon methods of mining used. If the main haulage road is driven ahead with no other guide than the plan of the vein on levels above, it is possible that it will not parallel the vein, but rather will wander away from it, or into it, where the vein makes sharp and unexpected turns. If the drift diverges from the vein, increased footage in haulage roads and crosscuts will result, for the same tonnage of ore developed. If the haulage road converges toward the vein, a decreased footage is inevitable, but increased cost of timbering in bad ground and heavy repair expense follow. In one instance with which I am familiar a sharp turn in the vein, sharper than on levels above, and not vertically under, was intersected by the haulage drift, resulting in a spiling job lasting nearly a month as a result of trying to get the haulage road through the vein to continue on the hanging-wall side; and it was finally necessary to go back and drive a new length of haulage road skirting this area.

Stope development in such a vein usually starts with a drift on the footwall, heavily timbered, from which the raises for stoping purposes are run. The haulage crosscuts must curve into the vein drift with a short-radius curve, as a long curve takes out more ground than can be spared if a suitable and efficient raise interval is to be maintained in the stopes above. As haulage crosscuts approach the vein they must be more heavily timbered, as the curves are points of excessive weight, necessitating heavy and constant repairs, and the tracks are hard to keep in alignment and condition. These curves into the vein drift are usually the points of greatest trouble in haulage, on account of derailment, accidents, and congestion, and their elimination would go a long way toward improving and reducing costs on the haulage system. The vein drifts are slow to advance and expensive, and as soon as any portion of the vein is opened up, it begins to generate heat, so that, by the time the drift is prepared and the raises are up, the area is so hot as to make stoping work extremely uncomfortable. Two advantages that the vein drift has, which, however, it shares with any

raises or other drifting in the block, are: It drains the area to be mined, thus improving working conditions in the stopes, and thereby offers a chance to sample the block of ground to determine its grade and the tonnage available.

Several Methods Can Be Used

There are several methods of winning the ore out of a block of ground in the type of vein under discussion, among which may be mentioned the following:

1. Square-set sections, one section at a time being taken up and filled with waste before the next one adjoining is started.
2. Square-set sections alternating with the Mitchell top-slice system.
3. A method of alternating square-set sections and flat top-slicing panels at varying length.
4. An all-flat top-slicing method.

Methods 3 and 4 are perhaps the most thoroughly proven systems in use, and, although newer than square setting, show a higher general efficiency and a lower cost. The only difference between them is that in method 3 the top-slice stopes are interrupted at intervals, and square-set sections three to five sets along the vein and extending completely across it are mined up and filled with waste. Such a filled section serves the purpose of a barrier in case the timber mat in one of the top-slice sections catches fire.

Method 4 is continuous top slicing through the full length of the orebody, and offers the decided advantage of making it possible to open up a panel at one end, organize the work and the crew, and continue uninterrupted over a long distance before having to shut down and start over on a new floor. The increase in efficiency and reduction in cost in a long slicing panel should be very marked as compared with a short panel as in method 3. A greater flexibility is possible in method 4, for as soon as one floor has advanced a safe distance, 30 to 60 ft., a second floor can be started, and later a third or fourth floor, thus greatly increasing the daily tonnage from a restricted area, whereas this is hardly possible in method 3.

In spite of the high rate of extraction from these methods, they are still worthy of attention as offering the best chance for further improvement through systematizing the work as at present conducted; but more important still is the thought that, from experience gained, a new system may be devised which will improve the general mining conditions, increase greatly the stoping efficiency as well as the over-all efficiency of the mine, and effect great economies in mining costs.

Details of Method 4

At intervals of 150 ft., crosscuts are driven from the haulage drift to the vein, and the vein drift is extended to connect (see Fig. 1). Ditches are necessary in the haulage drift, crosscuts, and the vein drift, but it is usually sufficient to drop one of the lifters in order to break out for this, after which the shovelers can pick out enough gravel to make a suitable ditch. Crosscuts, on nearing the vein, and the vein drift are heavily timbered with 10x10-in. or 12x12-in. timbers, the posts on the ditch side being 9 ft. long and on the other side 8 ft. Double caps are necessary at times. At the end of each 150-ft. section, where the crosscut enters the vein drift, a two-compartment cribbed raise will be driven to the top of the ore, or to the level above, to serve as a manway and as a timber- and supply-way for the stope section. At intervals of 30 ft. along the vein drift, and between the main raises, one-compartment cribbed raises will be put up from the vein drift to a height of 40 ft. above the rail. At this height an intermediate drift will be driven from one main raise to the next, connecting with the tops of all the one-compartment cribbed raises, and timbered with 8x8-in. square-set timbering. Grizzlies can be put over the tops of these raises, in the drift, if necessary. On each side of the intermediate drift, and over each one-compartment cribbed raise, a raw raise is extended to the first stoping floor above. These raises will be staggered back and forth across the width of the top slice panel, and will be approximately at 15-ft. intervals lengthwise of the stope on the topmost floor. On each subsequent floor the spacing becomes more irregular and poorer for mining purposes. The block is now prepared for stoping, and a panel heading is driven to connect between the two-compartment cribbed raises at the ends of the section. This heading is followed by a flat top-slice breast the full width of the veins, 10-ft. round posts and caps with 2 by 12-in. by 10-ft. mat boards being used.

The greater part of the ore has to be shoveled into the chutes in this method, although with the spacing of raises it is efficient work. As the breast is advanced, all posts behind the working area are bored and blasted, allowing the mat to settle down on the new floor and become consolidated as soon as possible, so that lower floors can be advanced with the least possible delay. Ore extending into the footwall or hanging wall, if there is no mat overhead, is mined off by square setting, and a flooring laid, usually of double thickness when under a rock back. See Fig. 3-*A*. On subsequent floors the ore in the walls can then be mined by the usual top-slicing method. As there are no raises in either wall, if the ore extends very far out, wheelbarrows are needed to get it to the nearest chutes.

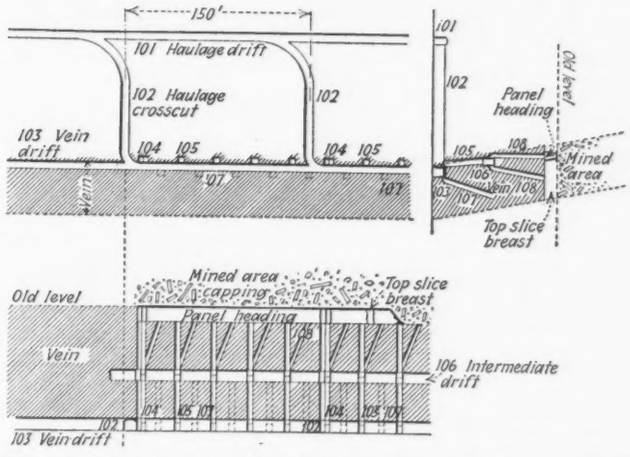


Fig. 1—Development for flat top-slice stoping method

All hoisting of timber and supplies is done through the two-compartment cribbed raises by means of small air hoists. Small fans, installed on the levels, force air through flexible ventilation tubing through these raises into the stopes.

Before stoping operations have reached the intermediate level, one-compartment cribbed raises are put up between those already driven from the vein drift to the height of the intermediate drift, making the final spacing of raises 15-ft. center to center. Stoping is then continued down to the floor next above the main level.

The ore on the main level is taken off through raises that come up from the level below.

Stoping efficiency, including the driving of panel headings and all repair work in raises, ranges between six and seven tons per man, and occasionally as high as eight tons per man is obtained.

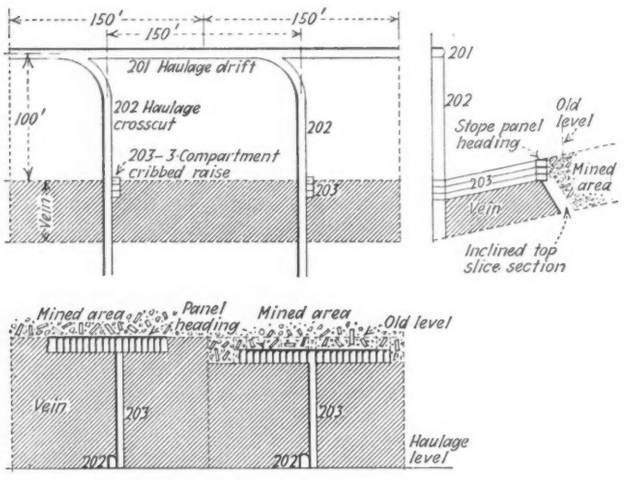


Fig. 2—Development for inclined top-slice method using scrapers

For details of flat top-slicing methods see several excellent articles in the files of *Engineering and Mining Journal-Press* and the *Transactions* of the American Institute of Mining and Metallurgical Engineers.

Proposed New Method

In the new arrangement for stoping (see Fig. 2) the main haulage road will be driven ahead to, and slightly beyond, the turnout point for a crosscut, where it will be stopped temporarily. The crosscut will next be extended around a 50-ft. radius curve, and as far as the footwall of the vein, where it will be stopped. At this point the bearing of the vein can be fairly well determined and new lines hung for the continuation of the main haulage drift, which will then be extended far enough to start a new crosscut. Crosscuts will be turned off at 150-ft. intervals.

No work will be done in the vein until the haulage drift has been extended to the extreme limits of mining operations, after which, retreating toward the shaft, and as they are needed, each crosscut will be extended across the vein and far enough into the hanging wall to make tail room for the haulage trains. A two- or three-compartment cribbed raise will be driven from the crosscut to the level above along the footwall of the vein. This will be the only raise in each stoping section, and will be used, one compartment for an ore pass, one for a timber- and supply-way, and one for a pipe-way and man-way. The completion of this raise marks the end of all preparatory development work in the block.

The grade of ore in each block of ground will be obtained by a careful sampling of the last floor mined off in the block immediately above the new one under development and of the ends of the various floors in the preceding block, together with sampling in the haulage crosscut across the bottom of the block at its central point, and in the three-compartment cribbed raise extending through the center of the block on the footwall side. If necessary, small crosscuts can be extended across the vein from the raise at intervals in elevation, for sampling purposes and to estimate the width of the vein.

Scraper at Top of Raise

A double-drum hoist and scraper will be installed at the top of this raise in such a manner that it can be used to scrape from either direction along the vein, or the scraper can be disconnected and the rope passed through the adjoining compartment to hoist timber and supplies. A small fan will be installed at the foot of the raise or at the entrance from the main haulageway, and flexible ventilation tubing carried up the raise to ventilate the stoping area.

A panel heading will now be driven in either direction off the raise for a distance of 75 ft. (with 150-ft. spacing of crosscuts below) along the footwall of the vein. These headings will be timbered with 10-ft. round posts and caps on the top floor, and floor bearers will be laid across the heading, one near each drift set. These bearers will be covered with 3x12-in. or 2x12-in. by 10-ft. planking, laid solidly. The planks will be beveled on the ends, and laid in such a manner, with the bevels overlapping toward the raise, that the scraper will have no tendency to dislodge any of them. In subsequent floors, the bearers laid on the floor above will become the caps for the heading sets. The foregoing is true only when the vein is nearly vertical. In flatter veins, the panel headings are offset so far that new caps are necessary on each level in the drifts. Floor bearers will be necessary, however, to keep the scraper runway in alignment, and they still may serve a purpose as caps in mining off the footwall side of the vein, as will be seen in Fig. 3*B* at *D*. It will be noticed also that, owing to the offsetting of the panel headings, there will be a difference in the relation of the post lengths. If 10-ft. posts are desired throughout the slicing area, then in the panel headings subsequent to the first the posts will have to be shorter than 10 ft.; or, if 10-ft. posts are desired in all panel headings, then on floors subsequent to the first all slicing posts will be longer than 10 ft., and this difference will increase as the vein departs from the vertical.

Heading timber will be the same as in ordinary inclined top-slice work, except that there will be no raises to be timbered over in the drifts; consequently, no protective timbering at the collar of each raise will be needed, grizzly poles across the drift at close intervals can be dispensed with, and the flooring will be closely laid to provide a sliding surface for the scraper. All ground broken will be scraped back to the main raise in the block.

Inclined Top Slicing Started at Each End

Inclined top slicing will be started at each end of the block, the scraper being reversed as needed to draw the broken ore from each side. As indicated in details of the method appearing in the files of *Mining Journal-Press* and in the *Transactions* of the A.I.M.E., inclined top slicing is carried on in sections measuring 10 ft. wide along the panel heading, beginning at the extreme ends of these headings. The interval is 10 feet, as this is the length of all round timber used in the stopes, and as the floor bearers are laid parallel with the panel heading, a complete cycle of operation can be maintained. Each section will be drilled and blasted, the muck which has all rolled into the panel heading will be scraped away, timber stood, and a flooring laid.

In each section, after the first round, it will be noted that, as the muck rolls down the incline and away from the face, no delay in drilling and timbering is incurred as is usual after blasting. This is one of the great advantages of this method of stoping. The sequence of operations is continued up the incline until the hanging wall or the limit of the ore has been reached. All the posts except the line next to the breast are then bored and blasted and the mat is allowed to settle down onto the floor. A new section is now ready for starting.

The amount of ore to be removed on the footwall side of the panel heading will depend on the degree of dip of the vein—the flatter the dip, the more ore to be removed. This footwall ore will probably be removed and the area carefully timbered to prevent runs before the section opposite can be started. Lagging will then be nailed to the posts on the footwall side of the panel heading to keep ore blasted in the hanging-wall section from being shot beyond the panel heading and out of reach of the scraper. This lagging, if properly placed and with the lower lengths beveled on the ends and lapped, will serve to act as a guide for the scraper traveling through the heading.

Stoping work will retreat toward the main raise, to within a safe distance, leaving the smallest practicable pillar for protection. The scraper, pipes, and tubing and all other supplies and timber will then be removed and installed on the floor below. The panel headings will be started on this new floor and extended to the safe distance of 15 or 20 ft. Auxiliary openings can now be made from these headings into the headings above, and the pillar worked out as rapidly as possible. Flooring will be carefully laid and the main raise well covered and braced before the timber in this area is shot down. The last retreat of the men from this stope will be through one of the auxiliary openings into the heading below.

Efficiency in top slicing by the inclined method, including all panel heading and the necessary repair work, has ranged from nine to eleven tons per man, with occasionally figures as high as fourteen tons per man, and there seems to be no reason why the proposed system will not give figures equally good.

Removing Ore in Walls

In the flat top-slice method, when ore extends out into the wall, where there is no mat above from previous operations, square setting is usually resorted to if any great area is to be removed. Care is exercised in breaking into the wall, on account of the danger of a caving brow. Where this danger is real and immediate it is usually good practice to break out only about 2 or 3 ft. of ground, and carefully stull under the brow with headboards and lagging laced between the headboards and the regular slice timber. The next round will also be a short one of 2 or 3 ft., which, when cleaned out, will permit the standing of the first square set and complete protection of the brow.

Square-setting is then continued as far out as the ore extends, the muck being shoveled or trammed in wheelbarrows to the regular stope chutes. As the stope advances, the face of the square-set area is carried ahead with the slicing face. Floor bearers are laid in the square-set area, the same as in the slice, and a solid flooring is laid. As the stope advances, rows of square sets are braced, and all sets behind this bracing are shot down to allow the back to settle onto the mat. On subsequent floors slicing can be carried out under the square-set areas, using the floor bearers as caps, as in the usual method.

When the wall rock is hard and stands well, or the area to be worked out is not very large, simple stulls and headboards can be used in place of square sets, but in all cases floor bearers and flooring should be carefully placed to facilitate work on subsequent floors.

In the inclined slice, much the same methods can be used for removing ore in walls. The problem of getting safely under the brow is a more difficult one, however, and greater care is required.

The ore can be removed by means of a flat square-set section, or with stulls and headboards, exactly as in the flat slicing method. This, however, involves shoveling the ore to the top of the incline, or, in extensive areas, the use of wheelbarrows.

A Square-Set Stope on a 30-Deg. Incline

The method advocated, purely an experimental one, so far as I know, is to develop a square-set stope on the same incline as the top slice—that is, 30 deg. from the horizontal.

To get safely under the brow, a short round is blasted, and the first square set stood with the head posts placed solidly against the last posts of the inclined slice. An angle brace can be put back of this slice post in extreme cases.

As will be seen in Fig. 3*B*, the development of the method from this point on will be the same as in the flat slice, except that no shoveling of ore will be required. In very heavy, loose, or squeezing ground the point of greatest weakness in the method will be along the line of contact of the square sets with the slice posts. That is, unless properly and securely

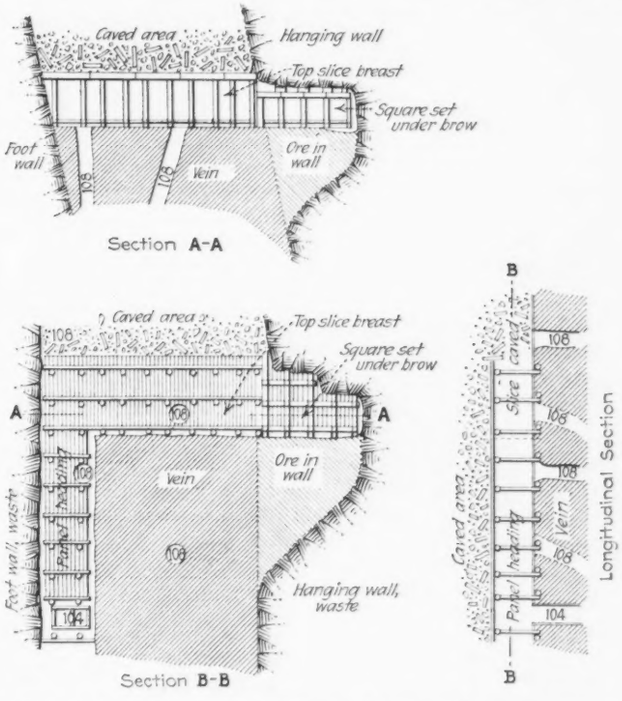


Fig. 3A—Plan and sections showing flat top-slice stoping method. See also Fig. 1

braced, the slice post against which the first square set makes contact will take weight and break at the height of the square-set caps. To offset any marked tendency of the wall rock to break away into the stope and develop this pressure, the square-set posts may be

given a slight lift up the incline, the same as the top-slice posts, although this should be done only in extreme cases, on account of the added difficulty of framing square-set posts on an angle. An alternative method would be to use shorter posts, 6 ft. 3 in. or 6 ft. 6 in. long over all, in the square-set work; these, being more easily and more quickly handled on the incline, are stronger in proportion to the cross-section, besides making it possible to blast and remove less ground while working on this first floor under the brow.

Simple stulling on the incline will be feasible only in small areas, and where the wall rock is hard and stands well, especially at the brow.

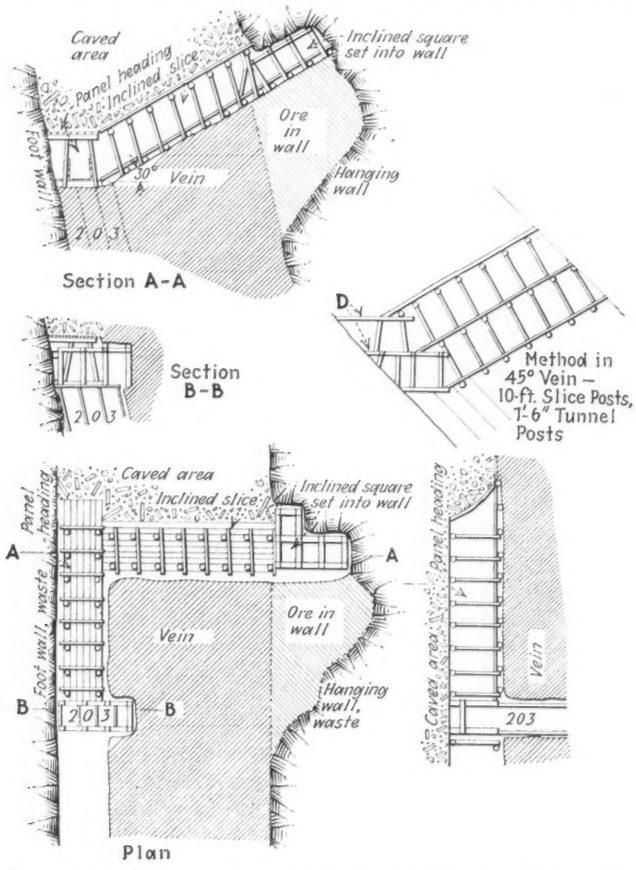


Fig. 3B—Plan and sections showing inclined top-slice stoping method with scraping. See also Fig. 2

ADVANTAGES AND DISADVANTAGES OF THE TWO METHODS

The advantages of flat top slicing are:

1. Extensive openings into the block before stoping begins drain the block thoroughly.

2. These openings also permit complete sampling of the block before stoping begins.

3. Ore in walls can be obtained by careful mining with the least danger of loss through caving ground.

4. A relatively small timber consumption of eight board feet per ton, but at a sacrifice in efficiency per man-shift.

The disadvantages are:

1. Extensive openings into the block before stoping begins allow the development of excessive heat.

2. Crowded conditions in the vein drift and near sharp curves cause delays, derailments, and accidents in the haulageways, resulting in increased cost and decreased efficiency.

3. The conditions as outlined for development do not give the maximum efficiency on all stoping floors. Only the top floor and the intermediate level floor are arranged strictly according to the scheme. On all other floors the raises are not correctly spaced. To arrange for the best raise spacing throughout would be prohibitive from the point of view of development cost.

4. To maintain a full tonnage capacity, many blocks must be kept open. This ties up excessive working capital over long periods, and results in heavy repair expense to maintain so many places in good condition.

5. Hoisting from several levels at one time, as is the usual procedure under these conditions, adds to the hoisting cost and increases the delay time in the shaft.

The advantages of inclined top slicing with scraping are:

1. A minimum amount of development work for the body of ore developed.

2. Uniform conditions throughout the stoping block, and the work, once organized, will continue with little variation from top to bottom of the block.

3. A stoping method of maximum efficiency for the conditions existing.

4. A haulage system working at maximum capacity with fewer accidents and delays.

5. The maximum production from a concentrated area with a minimum amount of working capital tied up in development work, a minimum number of places to keep in good repair, a concentrated haulage system, and all hoisting done from the fewest number of points, at a decreased cost.

The disadvantages are:

1. A possible lack of drainage in some of the blocks to be stoped.

2. A lack of sampling faces prior to stoping, which may or may not be a disadvantage, depending upon how spotty the ore is.

3. Lack of good ventilation at the apex of each inclined slice, especially if ore is to be removed in the walls. However, with careful attention to the auxiliary ventilation plant in the drift below, and the careful placement and regulation of the use of ventilation tubing, this condition can be minimized.

4. The added difficulty of getting the ore in the wall rock with the danger of occasional losses of ore through caving ground. This point, and the matter of ventilation as mentioned under (3) above, will require the greatest attention, and perhaps several different plans will be tried before one is found successful.

5. A greater timber consumption of about 10 bd.ft. per ton, but permitting by its use a much greater efficiency per man-shift.

For the purpose of making a comparison of costs of the two methods, assume blocks of ore 150 ft. long, 45 ft. wide, and 100 ft. high. These will be developed on one level, and mined off as described in each case, from a floor on the level above, down to the floor next above the haulage level. Such blocks, with ore in place averaging 12 cu.ft. per ton, will each contain 56,250 tons.

On this basis, the comparison of development and stoping costs is given in Tables I and II. The unit costs used are fairly representative of work done in the mines of this type, but whether they are higher or lower than the costs in any particular district, they are at least relative and therefore correct for comparative purposes.

The symbol numbers and names of working places

Table I—Cost of Mining by Flat-Top Slice Method, as per Fig. 1 and Fig. 3*A*

Symbol	Name of Working	Feet	Cost per Foot	Total Cost	Cost per Ton of Reserves
Development of Block					
101	Haulage drift, raw	150	$8.00	$1,200.00	$0.0214
102	Haulage crosscut, timbered half-way	107	11.50	1,230.50	0.0219
103	Vein drift, heavily timbered	150	16.00	2,400.00	0.0427
104	Two-compartment cribbed raises	100	8.50	850.00	0.0151
105	One-compartment cribbed raises	160	6.75	1,080.00	0.0192
106	Intermediate drift, timbered	150	10.00	1,500.00	0.0267
107	One-compartment cribbed raises	200	6.75	1,350.00	0.0240
108	Small raw raises	450	5.00	2,250.00	0.0400
	Total development	1,467		$11,860.50	$0.2110
Stoping the block					
	Development extracts 3,030 tons of ore from the block, leaving 53,220 tons to be stoped at an average efficiency of 7 tons per man and an average cost of $1.28 per ton, including bonus and contract payments.				
	Total stoping			68,121.60	1.2115
	Grand total, development and stoping			$79,982.10	$1.4225

are the same as given in Figs. 1, 2, and 3, to which direct reference may be made.

It will be noted that the new method effects a saving of 13.5c. per ton of ore in the block, on development work, and that the new scheme of development, in turn, permits a stoping method to be used that is actually four tons per man more efficient, and 17.5c. cheaper per ton of ore in the block. The total saving effected per ton of reserves is therefore 31c., an amount not to be lightly overlooked.

Besides this direct saving there is also the saving to be effected through better general mining conditions; more concentrated working areas, which permit of cheaper haulage and hoisting costs, cheaper supply handling systems, and fewer places to maintain in good repair. Also, there will be a reduced overhead expense per ton mined, resulting from obtaining a greater tonnage from the same number of men at work and from the same operating plant and equipment.

As a matter of fact, if under the new scheme proposed for development and stoping the same number of men can be employed as formerly, the plant being sufficient to take care of the additional tonnage produced, the saving in the indirect and overhead expense will on the average be greater per ton of ore, or per pound of metal produced, than will be the direct saving per ton or per pound made in development and stoping.

Conclusions

Although there is room for improvement in present practice through a greater degree of standardization in the work, new machinery coming into general use underground makes it advisable always to consider the possibility of entirely new methods, or at least new combinations of methods already well proven.

The scraper has been the most important addition to the list of underground machinery in recent years, and although it has made but slow progress in the Southwest and has had only partial adoption in a few places, its use is bound to increase. The delay so far has been due not to inefficient scrapers but to the kind of places in which it has been attempted to use them. It is hopeless to expect to adapt a scraper to any of the present Southwestern stoping practices, because the methods in use do not make possible an efficient setup for the machine and do not permit of a reasonable amount of straightaway scraping. The scraper is operating at its worst when its position has to be changed constantly, when scraping has to be done around an angular turn, or when small tonnages are scraped over comparatively long distances of 100 ft. or more. Conversely, it is doing its best work on tonnages over 2,000 or 2,500 tons handled in one setup of the equipment, on a straightaway haul with no turns or deflections in it, and over distances that average less than 100 ft. It is largely due to its being used under the former conditions that in a measure has discredited it as an underground machine in this territory.

Scraping costs will range between 5 and 7c. per ton under conditions of maximum efficiency, while hand shoveling costs in stopes are seldom less than 16c. per ton and more often will be from 20 to 25c.

Stope development costs will range as follows: For caving or shrinkage stopes, in which no shoveling is done, from 9c. to as high as 20c. per ton of reserves; for methods such as the inclined top slice, in which the development work is designed to eliminate shoveling by allowing all ore broken to slide into chutes, from 16c. to as high as 25c. per ton of reserves; for methods in which shoveling must be done (see method 4) but in which the combined cost of development and shoveling will be kept at a minimum, from 18c. to 30c. per ton of reserves, to which must be added a minimum of 16c. per ton to shovel the ore into the chutes, making a total of 34c. to 46c. per ton of reserves.

Table II—Cost of Mining by Inclined Top-Slice Method with Scraping, as per Fig. 2 and Fig. 3*B*

Symbol	Name of Working	Feet	Cost per Foot	Total Cost	Cost per Ton of Reserves
Development of Block					
201	Haulage drift, raw	150	$8.00	$1,200.00	$0.0214
202	Haulage crosscut, timbered half-way	175	11.50	2,012.50	0.0357
203	Three-compartment cribbed raise	100	10.25	1,025.00	0.0182
	Total development	425		$4,237.40	$0.0753
Stoping the block					
	Development extracts 625 tons of ore from the block, leaving 55,625 tons to be stoped at an average efficiency of 11.0 tons per man, and an average cost of $1.05 per ton, including bonus and contract payments.				
	Total stoping			$58,406.25	$1.0375
	Grand total, development and stoping			$62,643.75	$1.1128

From Table II and the scraper data given above it can be estimated that a combined scheme of development and scraping may be developed whereby the broken ore may be put into the haulage chute at a cost not to exceed 12.5c. to 15c. per ton. These figures compare very favorably with the drawing-off costs in caving or shrinkage stopes, and with the regulation inclined top slice, if the differences in conditions are duly considered; and they are much below anything that can be expected in stopes using hand shoveling as a means of transfer.

In wide orebodies, also, where for any reason it is undesirable to cave, development can be planned to make use of scrapers and inclined slides in such a manner that the footage of development can be reduced by 70 to 80 per cent, substituting in part an increased cost for scraping and auxiliary ventilation. However, a discussion of these possibilities is not within the scope of this paper.

The future of many mines will depend on new, cheaper, and more efficient stoping methods, developed to offset the increased cost of ore that must be mined at great depth, or which will be of lower grade; and here as in every other line of industry the greatest development may be expected through the adoption of methods designed to use to the utmost the latest types of labor-saving machinery, rather than to depend entirely on the ability of the management to increase the productivity of the old hand methods of mining.

Russian Asbestos Mining Reviving

This Industry, Hit Hard by the War, Now Shows Gradual Improvement—Exports on the Increase—Hamburg the Distributing Point

By Leo Berlinraut
Berlin, Germany

Leo Berlinraut

BEFORE the Great War, Russia held second place among the asbestos producing countries. The largest deposits of Russia are situated in the Ural Mountains, where they are found generally in connection with the masses of serpentine rock. There are also many occurrences of asbestos in Siberia and in the Caucasus, but not all of them are of industrial importance.

Russian asbestos which has been exported came principally from the well-known Baskenovo district. The deposits are situated in the Province of Perm, 90 km. northeast of Sverdlovsk (Ekaterinburg). Further northwest, the asbestos belt runs to Reshevsk (the Okunevsk mines) and thence to the Alapaievsk and Neviansk deposits. South of them, asbestos was discovered in the Province of Orenburg, in the Orsk mines as well as in those of Kholmisty. The following notes tell something of the most important deposits:

1. *Baskenovo*—The Baskenovo deposit is situated 35 km. from the Baskenovo-Omsk railway and 90 km. northeast of Sverdlovsk, near the lakes of Tshutshie, Talitzk, and Okunev. The length of the asbestos belt is about 18 km. and the width from 200 to 1,200 m. This deposit has been worked since 1886 by means of open quarries at a depth of from 4 to 36 m. There are in all twenty quarries, six of which are regularly worked, while at the others only preliminary operations have been conducted. In these districts there are still large undeveloped asbestos deposits, which have been prospected to a depth of 60 m. The reserves of the asbestos deposits of Baskenovo have been estimated at more than 1,000,000 tons. The quality of the asbestos is excellent, the fibres being very dense and yet easily separated from the rock. Production of good-quality material is comparatively large.

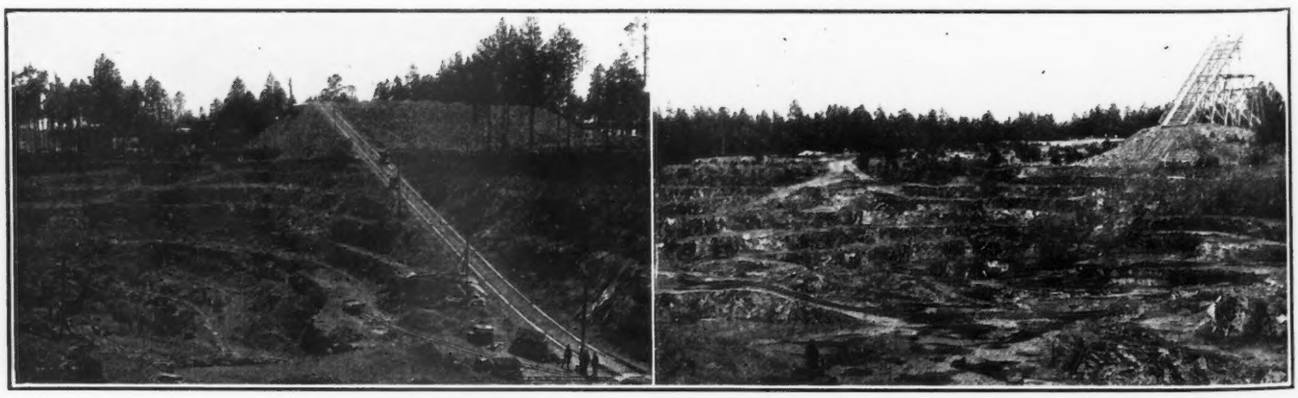
The whole district has been electrified, but the power station is inadequate. Water is taken from the pits by means of electric pumps. The asbestos is sorted by hand before going to the mills, which are five in number. A sorting plant recently completed has a capacity for an annual production of 30,000 tons. Air drills are used in mining, and the asbestos is moved by six cable derricks, one chain trolley, and two cable trolleys. Equipment includes 50 km. of trolley lines, 1,000 reversible lorries, 200 wooden cars, and seven locomotives. There are at Baskenovo dwelling-houses and administration buildings for about 5,000 employees.

Up to 1914 the deposits of Baskenovo furnished about 96 per cent of the whole asbestos output in Russia, and their importance has not diminished since that time. Table I shows the production of sorted asbestos in the different mines of the district in 1913, 1915, and 1923. The figures for 1915 have been taken from the report of the British vice-consul at Ekaterinburg (now Sverdlovsk); the others from sundry reports.

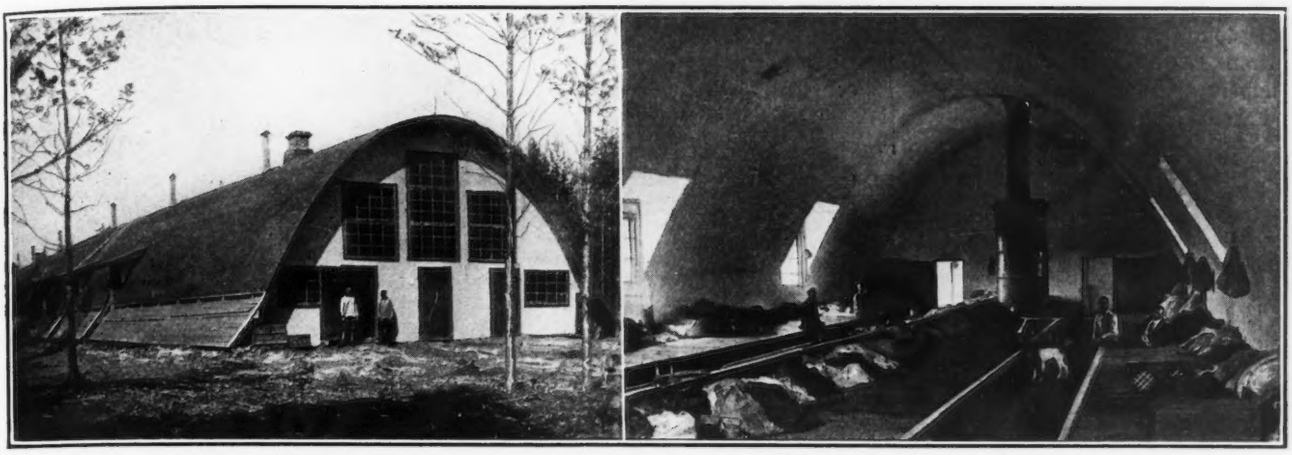
Table I—Asbestos Production of the Baskenovo District

Names of the mines	Annual Output, Metric Tons 1913	1915	1923
Southern mines on the banks of the Grasmushka River (late Italiano-Russo)	1,300	50	....
Vosnessensk and the affiliated mines of Korevo	11,500	4,400	
Reftinsk	8,000	2,500	7,850
Mukhanovsk	1,400	950	
Okunevsk	150	....	....
Totals	22,350	7,900	7,850

2. *Alapaievsk*—The Alapaievsk district is situated 32 km. from the Alapaievsh plant and about 6 km. north of the Neiva River, near the villages of Melkoserovo and Krivka. It has been worked since 1906. Serpentine rock outcrops over the whole Alapaievsk district and attains some places a width of 16 km., but no reliable estimate of the reserves can be made. In 1918, the Allied American Corporation, a branch of the Allied



Asbestos workings in the Alapaievsk district



Living quarters for miners at Baskenovo. Note the steep roof for snowy country. Interior view shows dormitory

Drug & Chemical Co., received a license for the exploitation of the Alapaievsk deposit, and soon after began work by doing much repairing in the buildings as well as to the engineering equipment. In the summer of 1922 about 1,000 workmen were employed, and about 350 tons of asbestos was produced; but little has been done since.

3. *Neviansk*—The mines of the Neviansk district are situated 14 km. from the Gornosavodsk railroad and 30 km. north of the Neviansk plant. Since 1909 the exploitation has been carried on in four quarries, of a depth of 16 m. Reserves at Neviansk are considerable, but the asbestos is mostly of inferior quality. The pits formerly belonging to the Neviansk circuit are comparatively well equipped and are electrified. One of these, the Krasnouralsk mine, has been recently reopened. Dwelling and administration buildings are in fair condition. The greatest output was about a thousand tons (in 1913).

4. *Ostanino*—The Ostanino deposit, worked since 1909, is situated about 6 km. from the Reshewsk plant. It is estimated that 100,000 tons is available; but the veins are scattered over a large area and mostly contain inferior grades. The output in 1913 amounted to 170 tons.

5. *Kholmistis*—The Kholmistis deposit is situated about 35 km. from the Samara-Zlatoiestovsk railroad, on the River Miass, near the village of Novo-Tagilskoie. This deposit is very similar to that of Neviansk, but less abundant, and its asbestos is harder. Toward the north in the direction of the Karabash copper mines, and in the Zlatonstovsk district, asbestos of good quality is found in some places, but these occurrences are still to be investigated before anything definite can be said.

Hospital at Vosnesenk, in the Baskenovo district

6. *Aktashevsk*—The Aktashevsk deposit is situated between the Verkhneuralsk and Beloretsk plants. In this district varieties are found of a chrysotile as well as of an amphibole character. Investigation seems warranted.

The Psantshinsk deposit, between Orsk and Orenburg, and a large number of other occurrences, which have been still little explored, are known in other districts of the Ural Mountains. Possibly the occurrences north of the Bogoslovsk plant will gain an industrial importance, but they are not as yet fully explored.

Among the Siberian occurrences are: Iltshirsk, in the southern part of the Province of Irkutsk; Uriankha, 19 km. west of the mouth of the River Alash; Pishpek in the Province of Semeritshensk; and several in the Altai Mountains along the River Katun. In the Caucasus are the following deposits: Kutais, in the Sharopansk district, and Shusha, in the Province of Elisavetpol, where was found amphibole asbestos of different kinds.

Asbestos mining in the Caucasus, and to an extent in Siberia, generally has been of an irregular and occasional character. Only the Iltchirsk mines are well equipped, and their output of chrysotile asbestos has amounted to about 1,000 tons, part of which was exported.

Before the war, merchantable grades of Russian asbestos found a market not only locally but also abroad, particularly on account of the hardness, purity, and elasticity of its fibre. Its resistance to acids and alkalies is said to be equaled only by the asbestos of South Africa. The Russian chrysotile is also perfectly scentless and therefore suitable for filtering wine and beer. The following grading is used by the Ural mines.

Table II—Grade and Length of Fiber

Grade	Length of Fiber, Inches	Grade	Length of Fiber, Inches
O	Over 1½	III	¾ to ⅜
I	¾ to 1½	IV	¼ to ¾
II	⅜ to ¾	V	Less than ¼

As can be seen from Table III, the output of the inferior grades (IV and V) has amounted to an average of 64.5 per cent, while the production of the higher grades (I, II, and III) was 34.5 per cent of the total output.

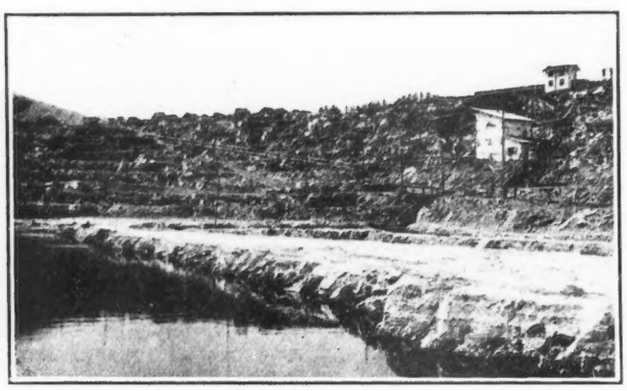
The following discussion of asbestos mining in the Soviet Union deals almost exclusively with the mines of the Baskenovo district, where nearly all asbestos mining

in Russia is now concentrated. From 1886 up to September, 1925, there were produced altogether more than 14,000,000 poods (36.11 lb. equals 1 pood) of asbestos, including about 13,500,000 in the Baskenovo district alone.

Table III—Production of Asbestos in the Ural From 1904 to 1921

	Output in Poods			Output, per Cent	
Years	Grades I, II, and III	Grades IV and V	Total	Grades I, II, and III	Grades IV and V
1904	184,379	168,149	352,528	52.3	47.7
1905	198,358	189,649	388,007	51.1	48.9
1906	221,199	293,815	515,314	42.9	57.1
1907	258,560	294,844	553,404	46.7	53.3
1908	275,064	318,638	593,702	46.3	53.7
1909	329,926	471,711	801,637	41.2	58.8
1910	203,518	515,618	719,136	28.3	71.7
1911	318,081	664,060	982,141	32.4	67.6
1912	380,409	863,423	1,243,832	30.5	69.5
1913	436,062	937,233	1,373,295	31.8	68.2
1914	243,278	727,464	970,742	25.1	74.9
1915	164,162	456,776	620,938	26.4	73.6
1916	265,863	477,295	743,158	35.8	64.2
1917	127,925	254,649	382,574	33.4	66.6
1918	24,280	58,417	82,697	29.4	70.6
1919	15,680	25,785	41,465	37.8	62.2
1920	21,727	66,900	88,627	24.5	75.5
1921	34,000	77,088	111,088	30.6	69.4
Totals	3,702,771	6,861,514	10,564,285	35.5	64.5

Until 1904 the output increased annually, and in the last years before the war the average number of work-



Ore of the asbestos workings near Baskenovo

men employed in the asbestos mines was approximately 5,000. About 16 per cent of the world's production came from Russia. The sudden decrease of the output was brought about by the war and the repeated mobilizations as well as by the revolution and the civil war, all of which causes led to a quick decrease in the number of workmen and lower productivity of each man. To this must be added the stopping of asbestos exportations.

In 1918 the Soviet decreed that the asbestos mines should become state property. However, not until the end of 1919, after the retreat of the Koltshak army beyond the Ural Mountains, could measures for the resuming and enlarging of production be adopted. It was hoped to increase operations and to get in 1920 about 50 per cent of the output of pre-war times; but partly in consequence of faulty organization, and partly owing to the lack of fuel and food for the workmen, which were difficult to get at that time, only 88,627 poods of asbestos was produced in 1920, including 66,900

Typical dump in the Ural asbestos fields

poods, or 75.5 per cent, of inferior grades. To stimulate asbestos mining, the Supreme Board for National Commerce and Industry established in November, 1921, a special trust called "The State Union of the Asbestos Mines." It includes the mines of the Baskenovo, Neviansk, and Ostanino districts, a millboard factory, a manufactory for asbestos products, and all auxiliary plants (mills, sawing mills, and brick kilns, which are closely united to the Ural asbestos industry). In the beginning the trust did not function efficiently owing to lack of working capital, but progress has been made, as indicated in the data of Table IV. The figures for the last twelve months are in part estimated.

Wages of the workmen have increased, but are still on a rather low level. They are higher than those of the miners in Rhodesia, Transvaal, and Cyprus, but reach only about 25 per cent of the wages paid in Canada. The monthly wage of a miner in the Baskenovo district was in 1923-24 from 16 to 33 rubles gold (1 ruble equals 51.5c.).

Production costs for asbestos, which vary according to the abundance of the deposit, the hardness of rock, and the management at the mines, amounted at Baskenovo in the years 1909 to 1913 to about 2 rubles per pood, f.o.b. station. Toward the end of 1921 they rose to about 5.50 rubles, and then, owing to the improvement in methods, went down to 3.70 rubles in the first and to 3.30 rubles in the second half of 1923, while the corresponding figures for 1924 were 3 and 2.80 rubles. It is hoped that this reduction will be accelerated when all of the lower-grade material is worked into millboard, paper, and roofings. There will also be economies when the railroad from Baskenovo station to the mines, which has been lately begun, is finished.

Before the war, asbestos had been worked in Russia by factories at Riga, Moscow, Leningrad, Briansk, Baku, Lublin, and other places as well as by both of the Ural mines factories. The latter two establishments have been reconstructed, to enlarge production, the one being destined for 6,000 poods of textures, ropes, and wick packing and the other for 60,000 poods of asbestos millboard.

Table IV—The Ural Asbestos Industry, From 1921 to 1925

	Output and Sale in Metric Tons								
Twelvemonth, From Oct. 1 to Sept. 30.	Sorted Asbestos Production	Sorted Asbestos Sale	Paper and Millboard Production	Paper and Millboard Sale	Asbestos Articles Production	Asbestos Articles Sale	Asbestite Production	Asbestite Sale	Average Number of Workmen
1921–22	3,314	2,118	500	254	26	20	.....	.....	1,382
1922–23	5,439	5,738	164	278	25	24	1,197	1,000	2,487
1923–24	8,331	8,632	100	346	35	46	2,969	3,247	2,800
1924–25	10,000	10,000	500	500	40	40	3,000	3,000	2,918
Total in four years..	27,084	26,488	1,264	1,378	126	130	7,166	7,247	.....
Yearly average....	6,771	6,622	316	345	32	33	2,389	2,416	2,397
In 1913.....	22,513	.....	490	...	30	..	969	.....	4,700

Not only has the whole production of the last twelve-month been sold, but a large portion of the stock on hand has been consumed. This is principally due to the greater demand for asbestos goods in Russia herself. While the higher grades of raw asbestos, as was the case previously, are exported, the lower-grade material is now as far as possible utilized for domestic industry, especially for roofing and fireproof materials.

Exports of Russian asbestos reached their height in 1912, when 13,260 tons, valued at about $900,000, went abroad. The lowest record for exportation during twenty-seven years took place in 1917, when only 246 tons was shipped. In the following three years (1918, 1919, 1920) no Russian asbestos was exported. Before the war the Ural asbestos was almost exclusively sent to European countries, about 65 per cent of the tonnage being conveyed to Austria-Hungary and Germany. In 1914, 1915, and 1916 England was the principal buyer. The exportation to non-European countries, especially Japan and the United States, began during the war.

Table V gives an idea of the average wholesale export prices of the Russian asbestos before and after the war:

Table V—Average Export Price for Ural Asbestos

In pounds sterling per metric ton, c.i.f. European port.

Grades	1913-1914	1920	1921	1922	1923	1924	1925
I	32–35	180–220	160–100	75–65	65–55	55–48	50–60
II	24–26	150–170	100–60	50–42	43–38	39–36	39–42
III	18–20	70–90	55–35	35–33	33–32	32–33	32–34
IV	12–16	30–40	30–22	22–19	20–19	19–21	20–22

Since 1921 the exported asbestos was carried almost exclusively to Hamburg and from this port it has been distributed to different countries, chiefly Germany, Austria, Belgium, Holland, and Italy. Only one shipload, of about 1,500 tons, was sent to London, and some smaller loads went to Latvia, Esthonia, Finland, and the United States.

Analyses of Bolivian Tin Ore and Concentrate

In a paper on "The Mineral Resources of Andean Bolivia," by Richard Pilz, recently published by *Metal und Erz* and translated in *The Mining Journal*, the following data are given concerning the tin content of the raw ores treated by the principal Bolivian tin-mining companies, the recovery in concentrating, and the tin content of the concentrates, which are known as barilla.

Producer	Tin Content of Ore %	Recovery %	Tin Content of Barilla %	Remarks
1. Llallagua (Catavi plant)	9.58	81	67	69 per cent if bismuth leached out
2. La Salvador (Uncia)	8.00	80	66	About ½% bismuth
3. Morococala	7.40	74	63	Ore from Pacos
4. Araca	6.70	(?)	59.5	Recovery formerly 50%, but plant lately improved.
5. Oploca	6.00	65	59	.....
6. Bebin Hermanos (plant only)	6.00	70	56	Ore from Pacos.
7. Aramayo	6.00	(?)	62	.....
8. Caracolles (plant in Pongo)	4.00	80	63	Contains some bismuth
9. El Salvador	2.50	35	60	.....
10. Machacamarca (Cia. Minera de Oruro)	3.10 4.30 (Pacos)	64 56.60	59	Pyritic ore with 850 g. silver p.t.
11. L. Soux Potosi (Velarde plant)	3.50	55	60	Mainly pyritic.
12. Chojñacota	2.70	(?)	68	Pyritic containing 5% copper.
13. Cerro Grande	2.5 to 3.0	(?)	66	Pyritic ore.
14. Berenguela	2.5 to 3.0	(?)	(?)	Pyritic ore.
15. Monte Blanco	2.50	65	65	Tinstone only.
16. Alantaña (San José Mine Oruro)	2.2	(?)	61 d 18	Pyritic with 1.4 g. silver per ton.
17. Huanuni	2.0	60	60	Ore from Pacos.

Injected Copper Sulphides

Interstices of Deposit at Capote Mine Filled with Thick Mineralized Solutions

By Graham John Mitchell

Chief Geologist, Cananea Consolidated Copper Co., Cananea, Sonora, Mexico

COMMENTING, in "Sartor Resartus," on what he calls our present advanced state of culture, of how the torch of science has been brandished about "with more or less effect" for five thousand years and upward, Thomas Carlyle remarks in reference to geology, "What with the labors or our Werners and Huttons, what with the ardent genius of their disciples, it has come about that now, to many a Royal Society, the creation of a world is little more mysterious than the cooking of a dumpling; concerning which last, indeed, there have been minds to whom the question 'how the apples were got in' presented difficulties."

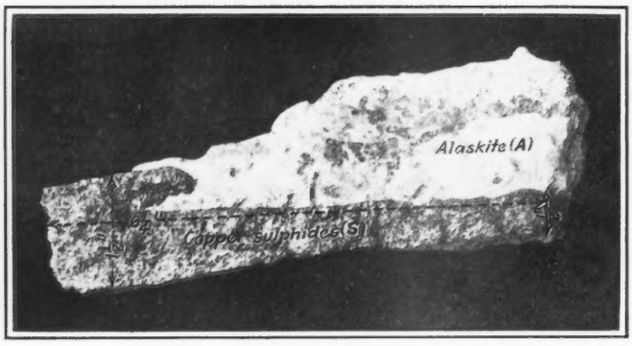
With an added hundred years of "torch brandishing," of intensive scientific research, various illuminating facts are being uncovered, theories of ore deposition have been proved to be more than mere theories, and it would seem that the problem of "how the apples got in"—of how different minerals reached their present locations—is nearer to being solved. But, with the still comparatively recent development of the magmatic theory of ore deposition, which explains conditions not satisfactorily accounted for by the lateral-secretion hypothesis, added questions have arisen, dealing, principally, with the nature of the ore solutions evolved by the magmas. Are they always, for instance, rich in gases and vapors and quite liquid, or may they sometimes be less attenuated, even viscous?

In the case of metasomatic replacements in limestone, the manner in which this rock can be completely changed to quartz, garnet, epidote, and other silicates, with associated ore, tends to prove that the solutions were quite liquid and gaseous and able to penetrate the rock along minute openings, depositing their dissolved mineral by a process of gradual substitution. In contrast to this type of mineralization are fillings in fractures, the ore and gangue forming a crystalline aggregate bounded by sharp walls which give little if any evidence of replacement. These veins sometimes contain rock remnants which appear to be rock fragments carried in with the vein matter[1]. A flow structure, analogous to that in the more siliceous igneous rocks, may be produced.

In his book, "The Ore Magmas," J. E. Spurr[1] states that "ore solutions are not always highly gas laden and extremely liquid, as has been generally conceived, but may represent thicker mixtures, residues of a differentiated magma which are forced into the inclosing rocks along openings such as fractures or bedding planes much after the manner in which dikes or sills are intruded." Since this explanation is at present occupying the stage of geological discussion and is, furthermore, not entirely accepted by all geologists, data bearing on the subject are of particular interest.

My study of the occurrence of copper sulphides in the Capote 15 mine, at Cananea, Sonora, Mexico, leads me to believe that in part they represent an injection of ore solutions of a rather thick nature. The orebody in the deeper workings of this mine is in a fracture zone

[1] J. E. Spurr: "The Ore Magmas," 1923.



Injected sulphide ore

roughly elliptical in form, with the longer axis striking north 45 deg. east. On the 1,100 level this zone is more than 500 ft. long and 200 ft. wide, dipping northwesterly at an angle of 85 deg. Among the rocks involved is granite porphyry, which in places grades into coarse pegmatitic patches; and a few feet further away transition into fine-grained aplitic material can be traced. Small quartz-monzonite dikes and a quartz-feldspar rock (alaskite), of practically the same composition as the aplitic material, noted above, cut the granite porphyry. The alaskite has been intruded into the granite porphyry in an intricate manner, extending here and there throughout this rock as dikes, stringers, and irregular masses. In it are quartz veins which carry feldspar and occasional sulphides.

The pegmatitic portions of the granite porphyry are made up chiefly of coarsely crystalline quartz and orthoclase, and contain pyrite, zinc blende, galena, bornite, chalcocite (primary), chalcopyrite, hematite, tetrahedrite, tennantite, muscovite, dolomite, calcite, apatite, topaz, zircon, and tourmaline. The quartz, dolomite, pyrite, and zinc blende in some instances line small, drusy cavities. The quantity of the sulphides in such cases is not great, although it does increase somewhat the grade of ore. The granite porphyry, especially in the groundmass, contains quartz, topaz, zircon, apatite, titanite, sericite, and tourmaline, the latter often in small radiating groups of crystals. The feldspar and quartz phenocrysts show varying degrees of alteration to sericite, the former being more susceptible, whereas the latter are either bordered by ragged fringes or are cut by veinlets of this mineral. The monzonite dikes and the alaskite are also sericitized. What appears in hand specimens to be fresh alaskite is found in thin sections to be strongly affected by the above-mentioned process.

Two Periods of Mineralization

Two periods of mineralization are evident. The first is characterized by pyrite with some bornite and chalcopyrite, these sulphides occurring as irregular replacement veinlets along fractures and as disseminations in the sericitized granite porphyry and alaskite. The presence, also, of tourmaline, apatite, zircon, titanite, topaz, and carbonates shows that the ore solutions at this stage were more gaseous and liquid and were thus able to permeate the entire fracture zone, where they deposited chiefly pyrite, sericite, and quartz.

Chalcopyrite and bornite increase noticeably in the second period, and sphalerite, galena, and tetrahedrite appear as additional minerals. Pyrite is plentiful, but in many of the fracture fillings it represents less than half the sulphides, the remainder being principally chalcopyrite and bornite. The ore of this second period occurs as a filling in fractures in the granite porphyry and alaskite. It is composed of intercrystallized pyrite, chalcopyrite, and bornite, with a little sphalerite, galena, and tetrahedrite, among which are sometimes seen quartz and small fragments of sericitized alaskite. Tourmaline, topaz, apatite, titanite, zircon, and carbonates are absent. The walls of these veins and the inclosing rock are sharply defined, the sulphides when leaving the main fracture passing out along others.

Fig. 1 illustrates a portion of one of these veins from the 1,400-ft. level, the deepest developed. It consists of fine-grained pyrite, chalcopyrite, and bornite, with a few crystals of galena and sphalerite. These minerals form an interlocking aggregate, among which are a few scattered quartz crystals and small pieces of alaskite. The rock inclusions are in the nature of sharp angular fragments resembling chips from an extremely brittle rock. They have none of the characteristics of replacement residuals. The absence in these veins of minerals like tourmaline, topaz, apatite, and sericite which accompanied the solutions of the first mineralization denotes a less gaseous content and accordingly a lower degree of fluidity. The very complete manner in which the solutions of the first period permeated the fracture zone would also indicate a more fluid and vaporous condition. Veins of the second epoch are more erratically distributed through the fracture zone, with a tendency to localization in the central portion. Even in the areas where most strongly developed they are not of uniform distribution, sometimes entirely failing to appear in blocks of fractured granite porphyry and alaskite, which blocks, however, have been strongly affected by the solutions of the first ore invasion.

The influence of fractures in determining the location of the veins is pronounced. Where the ore leaves the main filling it turns sharply into cross breaks. This broken condition in the ore zone is due to contraction stresses developed in the granite porphyry and intruded alaskite.

A summary of the major steps outlined in this discussion is as follows:

1. Intrusion of granite porphyry, with differentiated pegmatitic and aplitic phases, found irregularly distributed through the main rock mass. The gases and vapors evolved by this granitic magma deposited quartz, topaz, apatite, titanite, zircon, tourmaline, sericite, and carbonates, together with a little pyrite, chalcopyrite, bornite, chalcocite, zinc blende, galena, hematite, and tetrahedrite.

2. Intrusion of quartz-monzonite dikes which have been impregnated with pyrite.

3. Alaskite intrusions of dikes, stringers, and irregular masses and formation of fracture zone. This period is marked by silicification, sericitization, and wide-spread development of pyrite with a little associated chalcopyrite and bornite.

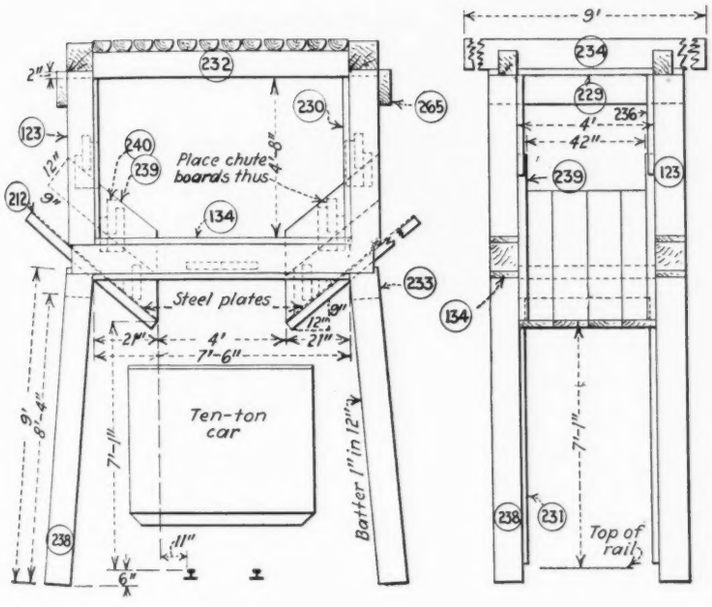
4. Fracture fillings of second period of mineralization. At this stage the highly concentrated ore solution or magmatic residue, with some remaining gases and vapors, was injected into the fracture zone and crystallized as veins of pyrite, chalcopyrite, and bornite, with a little sphalerite, galena, and tetrahedrite. While entering the fractures the ore magma enveloped small fragments of the inclosing rock, which are intermixed with the sulphides.

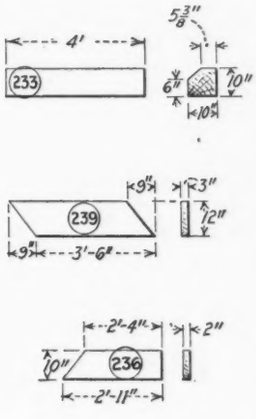
Useful Operating Ideas

Systematic Timbering Practice at Morenci

Systematic timbering practice begins with standardization of mining methods, which is in turn the result of close observation of physical conditions underground and an adaptation of mining methods to these conditions. Cost studies and labor performance are necessarily determined for the extremes and average conditions. Co-operation between mining engineer, superintendent, foremen, and shift bosses will result in the elimination of unnecessary detail and methods that are either unsafe, unsuitable, or uneconomic. The outcome of these studies is a definite set of mining methods for the mine and well-worked-out timbering designs.

At the Humboldt mine of the Morenci branch of the Phelps Dodge Corporation, mining methods have been systematized and timbering standards adopted for each mining method. In addition, the timbering for drifts,

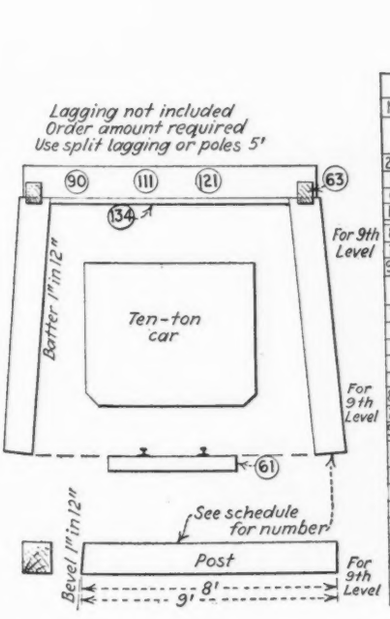




Timber Schedule
Drift Set Included

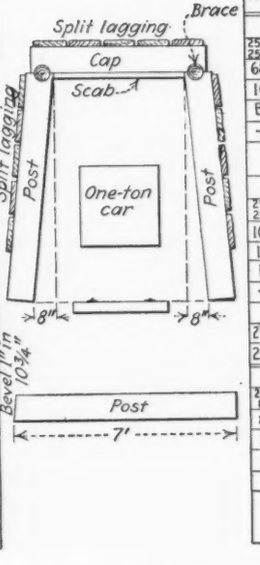
No.	Amt	Name	Size	Description	Bd.Ft.
111	2	Caps	10"x10"x8'-10"	Sq.Ends	147.2
212	8	Planks	3"x12"x5'	"	120.0
134	4	Scabs	2"x10"x7'-6"	"	50.0
123	4	Posts	10"x10"x5'	"	166.7
229	2	Scabs	2"x10"x4'	"	13.8
230	4	"	2"x10"x4'-8"	"	31.1
231	4	"	3"x10"x7'-6"	"	75.0
232	2	Braces	6"x8"x7'-6"	"	60.0
233	2	"	10"x10"x4'	Detailed	66.7
234	2	Caps	10"x10"x9'	Sq.Ends	150.0
236	4	Scabs	2"x10"x2'-11"	Detailed	19.4
238	4	Posts	10"x10"x9'	"	300.0
239	8	Side boards	3"x12"x4'-4"	"	104.0
240	6	Chute boards	3"x12"x3'-5"	Sq.Ends	61.5
265	2		4"x12"x5'-8"	"	22.6

Total B.M.= 1387.5



Timber Schedule

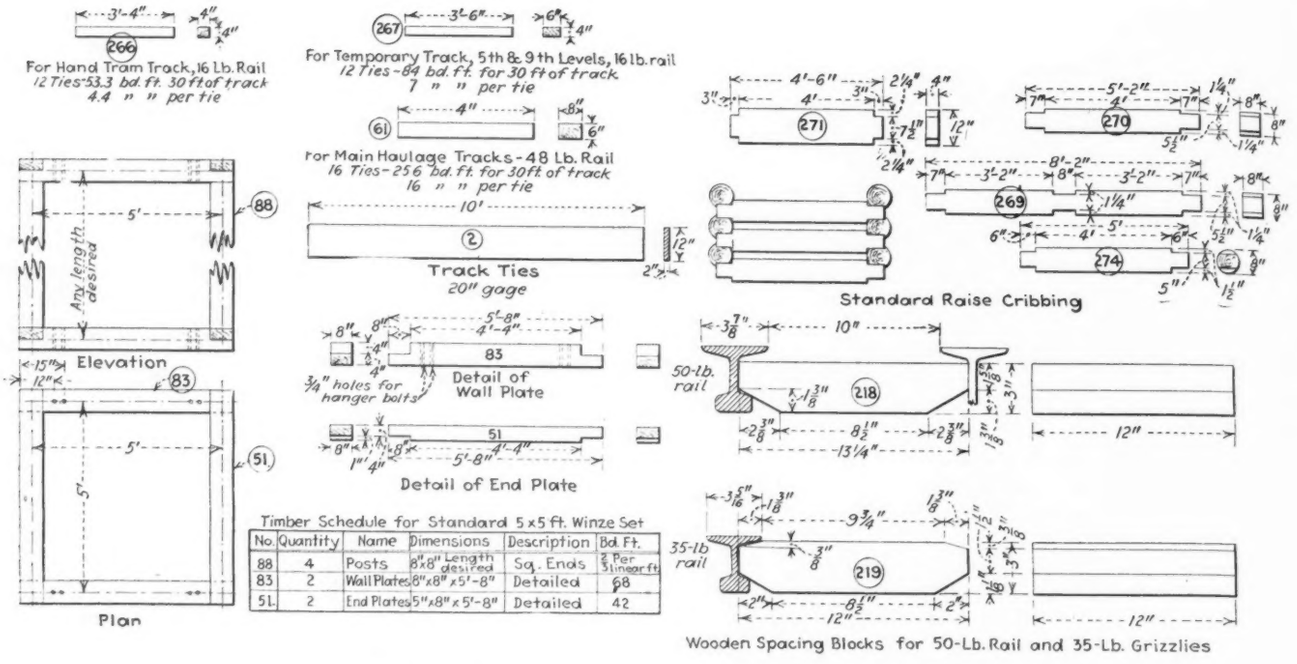
No.	Amt.	Name	Dimension	Description	Bd.Ft
Amount shown for 5 ft. advance					
8"x8" Set					
244	2	Post	8"x8"x8'	See detail	85
90	1	Cap	8"x8"x8'-9"	Sq. Ends	47
63	2	Braces	6"x8"x4'-2"	"	34
131	1	Scab	2"x8"x7'-6"	"	10
8' Posts, Total Bd.Ft. Exclusive of Lagging					176
245	2	Post	8"x8'x9'	See detail	96
9' Posts, Total Bd.Ft. Exclusive of Lagging					187
10"x10" Set					
110	2	Post	10"x10"x8'	See detail	133
111	1	Cap	10"x10"x8'-10"	Sq. Ends	74
63	2	Braces	6"x8"x4'-2"	"	34
134	1	Scabs	2"x10"x7'-6"	"	13
8' Posts, Total Bd.Ft. Exclusive of Lagging					254
238	2	Posts	10"x10"x9'	See detail	150
9' Posts, total Bd.Ft. Exclusive of Lagging					271
12" x 12" Set					
120	2	Post	12"x12"x8'	See detail	192
121	1	Cap	12"x12"x9'-2"	Sq. Ends	110
61	2		6"x8"x4'	"	32
26	1	Scab	2"x12"x7'-6"	"	15
8' Posts, Total Bd.Ft. Exclusive of Lagging					349
246	2	Post	12"x12"x9'	See detail	216
9' Posts, Total, Bd.Ft. Exclusive of Lagging					373



Timber Schedule for Standard Set

No.	Quantity	Name	Dimensions	Description	Bd. Ft.
Using 12" Round or 12"x12" Square Posts					
256 253	Rd. Sq. 2	Posts	12" rd. or 12"x12"x7'	See detail	
68	1	Cap	12"x12"x6'	Sq. Ends	
16	1	Scab	2"x12"x4'-2"	"	
B	2	Braces	5" rd. x 4'-2"	"	
—	30	Split Lagging	5' Long	"	
Using 10" Round or 10"x10" Square Posts					
258 257	Rd. Sq. 2	Posts	10" rd. or 10"x10"x7'	See detail	
103	1	Cap	10"x10"x5'-6"	Sq. Ends	
15	1	Scab	2"x10"x4'-2"	"	
B	2	Braces	5" rd. 4'-2"	"	
—	30	Split Lagging	5' Long	"	
Special Cap and Scab for Above Set					
254	1	Cap	10"x10"x4'-6"	Sq. Ends	
253	1	Scab	2"x10"x3'-2"	"	
Using 8" Round or 8"x8" Square Posts					
259 65	Rd. Sq. 2	Posts	8" rd. or 8"x8"x7'	See detail	
81	1	Cap	8"x8"x5'-2"	Sq. Ends	
12	1	Scab	2"x8"x4'-2"	"	
B	2	Braces	5" rd. x 4'-2"	"	
—	30	Split Lagging	5' Long	"	

Above, Haulage level chute front. Lower left, Motor drift sets for 10-ton cars. Lower right, Drift set for 1-ton car


For Hand Tram Track, 16 Lb. Rail
12 Ties-53.3 bd. ft. 30 ft of track
4.4 " " per tie
For Temporary Track, 5th & 9th Levels, 16 lb. rail
12 Ties-84 bd. ft. for 30 ft of track
7 " " per tie
For Main Haulage Tracks-48 Lb. Rail
16 Ties-256 bd. ft. for 30 ft of track
16 " " per tie
Track Ties
20" gage
Standard Raise Cribbing
Elevation
Plan
Any length desired
Detail of Wall Plate
Detail of End Plate
¾" holes for hanger bolts
50-lb. rail
35-lb rail
Wooden Spacing Blocks for 50-Lb. Rail and 35-Lb. Grizzlies

Timber Schedule for Standard 5 x 5 ft. Winze Set

No.	Quantity	Name	Dimensions	Description	Bd. Ft.
88	4	Posts	8"x8" Length desired	Sq. Ends	2 Per 3 linear ft.
83	2	Wall Plates	8"x8"x5'-8"	Detailed	68
51	2	End Plates	5"x8"x5'-8"	Detailed	42

Details of timber framing, track ties, and spacing blocks for grizzlies

raises, and other development workings has also been standardized. These standards have been reduced to a series of fifteen drawings. Each timber of a given size and with framing peculiar to itself is given a number which establishes it as a definite part of the structure.

Where the timber is also used in other structures, the same number is used. Timber schedules give the number, size, and board-feet measure, and the drawings indicate the framing details. In ordering timbers, the number of each timber and the number of timbers required are given to the timber-framing shop. The work of the timber-framing shop is thus systematized and waste is reduced to a minimum. There is also an economy in the use of timbers, as drift sets are designed with different sizes of timbers to correspond with various conditions. As an example, motor-drift sets for 10-ton cars are in 8x8-in., 10x10-in., and 12x12-in. timbers at 5-ft. centers. The drawing of the motor-drift set and other timber details are shown in the accompanying figures. The courtesy of McHenry Mosier, mine superintendent at Morenci, Ariz., is acknowledged for the drawings from which the accompanying illustrations were prepared.

Improving Plate Amalgamation

By Ira Lemmon

To remedy flouring of quicksilver in plate amalgamation, I have found that the introduction of air through a pair of parallel pipes, pierced with small holes at one-inch centers and placed across the plates in such a way as to direct the streams of air up the plate, is efficacious and an improvement over a shaking plate. The air supply is restricted to an amount that will not disturb the pulp flow too much. The plate between the pipes will require a little more frequent attention in dressing. By the use of a short length of connecting hose the pipes can be readily shifted and removed when dressing down the plates.

Cable Pipe Hangers

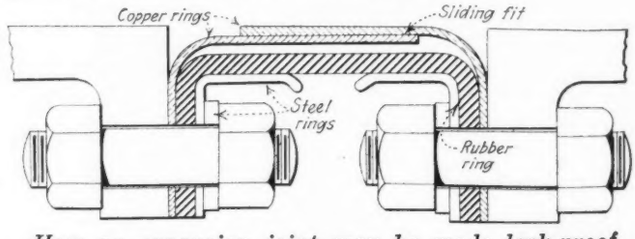
By Charles Labbe

In laying a 6-in. pipe line over a rocky hillside there were many places where the pipe had to be hung on the side of cliffs or upon large trees across ravines. Many other difficult conditions were encountered. Where it could be done, timbers were placed and the pipe was secured by iron straps, but in the most inconvenient places hangers were made out of $\frac{5}{8}$-in. and $\frac{3}{4}$-in. cable. Pieces were cut in suitable lengths, both ends being fastened with two cable clips. Cable has the necessary strength and is pliable enough to conform to the roughness of the support. Its length can be adjusted easily and it is normally available about mining camps.

Novel Rubber Expansion Joint

By W. F. Schaphorst

The accompanying sketch indicates how a large Eastern engineering concern solved one of its expansion-joint troubles by making the joint leak-proof with rubber, and makes a lengthy description unnecessary. The joint is stiff laterally because of the two telescoping copper rings which are indicated, and at the same time the joint will withstand high pressure. A joint of this kind is excellent for handling water and other fluids that will not attack the rubber. It cannot be used for high-temperature steam or water, as the rubber deteriorates under excessive heat.



How an expansion joint may be made leak-proof with rubber

Discussion

The Prospector and the "Blue-Sky" Law

THE EDITOR:

Sir—The Secretary of State for Washington, in the Oct. 31 issue of *Mining Journal-Press*, categorized the virtues of "blue-sky" legislation substantially as follows:

First, in states where this type of legislation does not exist, it is contended that the lack thereof constitutes an invitation to all the fakers and bunco artists who make their living by selling worthless securities to enter, presumably, the field of mining promotion.

Second, it is contended that when an honest enterprise goes to an Eastern state, in good faith soliciting money by the sale of stock to develop a prospect, many of the states will not entertain the application without the production of a permit granted from the state where the company or firm owning the prospect is incorporated.

Third, it is contended that a hardship results from inquiries coming to the corporation bureau offices of the Western state from prospective Eastern investors that cannot be fully answered by reason of the fact that the state bureau is not in possession of the facts involving the promotion.

In conclusion, the worthy gentleman postulates that the law "demands" a plan that is just, fair, and equitable to the man who places his money in the stock or bond of the enterprise.

How About the Prospector?

All this is very interesting from the standard of public morals, and it presents the usual viewpoint of the "reformer" type of public office holder who habitually attempts to curb economic frailties by bureaucratic control. However, there is another side to this legislative shield, and one which is not commonly presented to the legislators and the voting electorates who are inveigled into the creation of these King Solomon commissions, namely the side of the prospector.

Adopting legal phraseology to facilitate the discussion of the above-mentioned virtues, the prospecting fraternity denies that the percentage of fraudulent promotions in mining is great enough to warrant restrictive legislation of the character. On the contrary, it affirms that, considering the small number of promotions of this type as contrasted with the voluminous number of promotions of the so-called commercial, manufacturing, and general business type, most mining promotions are free from deliberate fraud. It is true that many prospects have failed to produce valuable mines, but this is chiefly because of the fact that every deposit of mineral is not necessarily a payable venture. The only way to determine whether it is or not is to dig and find out. This costs money, and the risk of failure is great.

There is an essential difference between a mining venture and a manufacturing one. It is this: a manufacturing enterprise may establish a market by advertising and sell the community a product that is not necessary; that is, it may create an artifical demand; a mine must have the ore in place, or it is an absolute failure decreed by the act of God and circumstances beyond the control of the promotor and engineer. The distinction is vital.

Therefore, the prospecting fraternity affirms that mining is not primarily an investment, considering the average type of mineral deposition in veins, but a highly speculative enterprise, and yet of such great value to the general advancement of civilization that it merits special consideration. It wishes to see it removed from the classification of investment enterprises.

Law Should Not Choke Initiative

The prospecting fraternity affirms that "blue-sky" legislation, to be of any value to humanity, must fit average conditions; it denies that existing laws fit average conditions in the mining industry. The average prospector traverses the hills searching for ore in order to profit himself, as well as humanity. If the incentive of personal reward is stifled, prospecting ceases. We have ample evidence of that in America.

The theory set forth by the bureaucrats that 20 per cent is sufficient return to promotors to adequately sustain a mining promotion to completion is doubtful. Most prospectors believe the ratio should be increased to 30 per cent, at least, on account of the increased sales resistance engendered by the slanderous avalanche of verbosity usually directed against mining promotions by individuals with commercial investment training and upbringing, and the unusual risks of development in each individual case. Mineral deposits are found where they lie, at varying distances from the market centers; with varying values in quantity and quality; and with varying conditions involving fuels, timber, and labor. A business enterprise may fix its conditions with reference to these development factors by wise choice of location: a mine cannot. Hence the risk of profit in mining is often doubled and incentives must be offered to buyers of stock because the enterprise is in and of its very nature excessively speculative.

Assuming that the sales department of a mining promotion is adequately protected by a sufficient reward to the salesman, there is one vital defect in the scheme of existing bureaucratic control from the viewpoint of the prospecting fraternity. It is that existing laws fail to give a prospector a method of raising money without a considerable outlay of capital, which he usually does not possess, and therefore force him to relinquish a substantial control to lawyers, bankers, or men of means, and also tax his capitalization heavily, before he can raise capital even to begin the development of his prospect.

Capital-Stock Tax Operates as a Penalty to Development

The prospecting fraternity believes that capital-stock taxes on the amount of capital stock issued for a mining promotion are in the nature of a penalty on initiative and engendered by the false idea that a mine possesses

capital before development because it has indications of ore. Now, as a mater of fact, metallic mineral in the ground has no value except the margin of profit between the cost of extraction and the market price. This cannot be determined by corporation bureaus, or anyone else, without exploration and development, which cost money, which must be raised by the sale of stock. To tax this stock on a paid-in-value basis at this stage of the enterprise is a tax on thrift and energy and woefully out of place. There can be no mineral development until a poor man can locate his property, hold it cheaply, raise money easily, and sustain himself while doing so. The risks of prospecting are not alluring to city-bred individuals, and only the hope of exceptional reward will sustain the faith and courage of even hardy adventurers in this arduous occupation. Hence, the prospecting fraternity suggests that all developing mining corporations be taxed initial and annual fees of only nominal sums.

The Plague of "Swivel-Chair Tax Collectors" and "Financial Pirates"

The prospecting fraternity objects to the fact that under legislation of this character no provision is made for the personal well-being and sustenance of the prospector himself after discovery, leaving him at the mercy of his promoting friends of legal and financial complexion, who usually give him a "job" as superintendent or some other innocuous position, and compel him to pool his stock for long periods of time during development, without any immediate reward for the discovery of the mineral. The fraternity believes that prospecting is a profession, demanding ever-increasing standards of intelligence and training in mineralogy, chemistry, geology, and metallurgy and many other sciences and crafts, and objects to working for nothing for the benefit of financial pirates and swivel-chair tax collectors. It believes that the ratio of its intelligence compared with that of the average government bureaucrat is as ten to one, and objects to regulation of its occupation by those incompetent, by reason of training and experience, to understand its problems.

Incorporation Statutes Should Be Uniform

If every state corporation commissioner were a Herbert Hoover, the situation might reverse itself. However, it is not so delectable. Therefore, the prospecting fraternity advocates the allowance of 10 to 20 per cent of the stock issued to the prospector in payment for his property to himself in person, so that he can sell it for what he can get to provide himself with sufficient funds to render himself independent and able to maintain his rights after corporate organization. This to be in payment for his education, training, and long years of hardship and suffering in the search for mineral. The prospector is faced with facts, not theories. He must live. It is suggested that statutes be enacted compelling the selling, on demand, of a reasonable amount of stock for the benefit of locators, so that the worth of the prospector's services to humanity may be recognized.

The prospecting fraternity affirms that any existing evils can be cured by organic legislative acts establishing a method of creating mining corporations, preferably uniform statutes in every state, or a national act, similar to the location law, whereby the rights of prospectors can be properly secured to them. Such an act should provide for two classes of stock, so that the prospector can have a substantial voice in his own property. It should provide for the prospector's future by allotting a small percentage to him to be sold for his benefit. It should provide a reasonable percentage for promotion profits, and should, preferably, provide for the amount it is sought to raise as a maximum, and then permit issuance in blocks of 10 or 20 per cent from the company treasury, in serial issues, with a statement in the stock certificates of the purpose for which the money is to be used, such as development, working capital, erection of mills, and other such purposes, and all fees should be nominal.

It would be better to have this all under the control of the newly organized Bureau of Mines of the Federal Government, as nearly all mines are located and developed in Forest Reserves and on the public domain. A statute of this character would supersede all the present multiplicity of state laws and, if properly given the backing of the American Mining Congress and the A.I.M.E., would benefit the mining industry in its explorational phase to a great degree. Permits under this type of act would then have the supervision of men trained in mining and geology and a much warmer sympathy could be established in the matter of mining promotions.

Only Productive Mines Should Be Taxed

Briefly, then, the prospecting fraternity objects to a multiplicity of state enactments which do not fit average conditions and the average prospector. It believes that organic statutes can define the promotional and corporate rights of the mining industry to a greater degree of satisfaction to all concerned than is now afforded by personal supervision of corporation bureaus, chiefly familiar with capital promotions only from the accounting and textbook standpoints. It believes that very little fraud will be engendered by this method of legislation, and that the personal eccentricities and idiosyncracies of the individual commissioners in the present bureaus will be eliminated, and much legislative logrolling on the part of investment banker's associations and better-business bureaus will be unnecessary. It believes that taxation of mines should be limited to producing properties, and the tax should be on the gross and not the net; that capital stock in a developing mine is not capital within the meaning of the tax laws, but an inchoate right to share in possible future profits, and of no value until these profits accrue. The prospecting fraternity respectfully proffers the slogan of "Stimulation and Not Reformation," for the consideration of the mining industry and the satellites of officialdom.

The foregoing discussion disposes of the first two "virtues" of Mr. Hinkle's article, and provides a "Plan" so greatly desired by him, which will benefit the mining industry and the prospecting fraternity, by "Hooverizing" the various corporation commissions.

State Associations Might Help

With respect to the third "virtue," the prospecting fraternity believes that associations of mining men in every state, affiliated with the American Mining Congress, and the local state geological surveys, whose functions may be properly reorganized to fit the conditions

now existent, can more properly and advantageously ferret out doubtful promotions than can the present corporation commissioners, who pass upon paper only and not prospects. It believes that fraud *per se* cannot be anticipated, but may be stopped after it is proved. There are adequate existing remedies now in existence for this purpose. If they were coupled by "watchful waiting" on the part of adequately equipped national and state mining bureaus, the situation would be well in hand.

A Substitute for "Blue-Sky" Laws

The prospecting fraternity also believes that the values of mining promotions could be secured by the establishment of state associations of mining men and a stock exchange in connection with each such association, with a paid secretary, whose duty would require him to list mining securities for sale. Every prospecting company would naturally submit to him its financial plan and its balance sheets, exactly as is now done on the New York and Curb exchanges, and sales in the dark would be eliminated. Those made in the dark would then be considered doubtful. With a complete listing of new mining locations in a state bureau, coupled with the indexing of the old ones, this situation would be well in hand. These matters need not be made compulsory by law, but could be established by mining men in voluntary accord, and special statutes could be framed in each state to afford co-operative functions. Co-operative machinery is amply provided for agricultural needs, and the mining industry will profit from a study of these statutes in that it will develop a more co-operative spirit.

Prospectors also believe that the proper person to inform Eastern investors as to the possible or probable value of a mining prospect is an efficient mining engineer, who has established his fitness by experience and reputation, and it is the duty of prospective investors to inform themselves of the whereabouts of this type of engineer. In other words, it is impossible to legislate ordinary prudence into individuals and not a proper function of the state to attempt it. A system of laws designed to mollycoddle humanity is obnoxious because it attempts to safeguard matters by the idea of certification, without providing for a thorough investigation of the individual cases demanding rectification, and thus works to the hardship of those whose rectitude does not need attention, by increasing the tax burdens and the expense necessary in unwinding the re dtape so prevalent in ordinary bureaus of government. If we must have bureaus, let us have bureaus of experts who know something of the vicissitudes of the mining industry as well as corporation law.

In conclusion, with all due respect to Mr. Hinkle, it will be observed that his ideas as to how a state should be run and the average ideas of the mining prospector as to how the industry should be benefited are as far apart as the poles of a magnet, and the gap can only be bridged by a bar of sufficient saturative capacity to encompass all the stray currents in the respective fields. A national statute is the proper bar for fraudulent promotions and idiosyncratic commissions. The members of the prospecting fraternity want "Freedom" to go to work and find mineral-bearing ground and the opportunity to profit from the find if "Lady Luck" ventures on their journeyings with them. God speed that day!

Harold Lee Gage.

Salem, Ore.

Consultation

Using Vanadium Drill Steel

"Can you give me some information on detail current shop practice in sharpening and tempering vanadium drill steel. I am not especially interested at this time in technical discussions, but wish to learn details of the procedure that an ordinary mine blacksmith can use with a coal-fired forge and slack tub."

The following data are from a small bulletin prepared by the Colonial Steel Co. of Pittsburgh, Pa.:

"Heat is the important factor in the use of steel for tools of any kind, and rock-drill bits are fully as sensitive to the effect of heat as any other kind of tool. Forging drill bits should be conducted with great care. The proper temperature for forging both hollow and solid drill steel is 1,550 deg. F., and it must not be higher than 1,750 deg., otherwise the steel will be overheated and lose the power of retaining its clean cutting edge. Do not attempt to complete the forging at one heating should the color fall below a red. In such a case place the steel back in the furnace and bring it up again to the necessary temperature; forging the steel below the proper working heat distorts its structure and brings about a brittle condition. In forging, it is better to finish with repeated light blows rather than by attempting faster reduction with a heavy blow.

Furnace Can Be Easily Constructed

"Modern methods are rapidly doing away with the use of the old-fashioned forging with coal or coke fire. For best results, the use of an oil or gas-fired heating furnace is absolutely essential. These furnaces are now being built and can be obtained from several well-known makers. In cases where it is not practical or desirable to purchase a furnace one of simple design can be constructed in any blacksmith shop, the burner only being purchased. The sides and bottom of the furnace should be made from boiler or tank plate ¼ in. thick of the following dimensions: Bottom 36 in. long by 18 in. wide; front and back 36 in. long by 14 in. high; sides 18 in. long by 14 in. high. Space for the door is cut in the front plate. Sides and bottom are lined with firebrick. The top of the furnace should be made removable and built of firebrick, held together by steel bands in the ordinary fashion. The legs for supporting the furnace can be made of common steel bars. The bottom of the furnace should be about 30 in. from the floor.

"Gas is preferable for fuel wherever obtainable. The oil, if used, should be kept in a storage tank below the level of the furnace in order to reduce the danger of fire.

"When the number of drills to be hardened each day is large, two furnaces should be used, one for the forging and one for the hardening. A pyrometer should be installed in connection with each furnace to determine the exact temperature and to enable the blacksmith to keep the furnace at a regular even heat. When a pyrometer is used frequent check should be made on its registering, at least once a week.

Substitutes for a Pyrometer

"For the purpose of investigation, when a pyrometer is not available, take a piece of drill steel bar about one foot long, nick it in six or eight places about one inch apart, place one end of the piece in the furnace and heat it until it is nearly white, letting the heat run gradually out toward the other end of the piece to a dull red and then quench in cold water. Break the piece with the sledge at the places where it was nicked and examine the fracture. The fracture which is the finest and has the most silky appearance is the one at which the heat was nearest to the critical temperature. By this practice a skilled smith can readily determine the proper heat, and it is commonly used.

"The difference in the amount of light in the shop on clear and stormy days, and differences which occur from time to time in the operator's eye and judgment, are objections to this method.

"Where a pyrometer is not obtainable or is temporarily

News of the Week

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Summary

ALASKA JUNEAU milled 281,500 tons of ore in December, yielding 62.88c. per ton. Deficit for the month is $9,550.

Burma Corporation has successful year—Much interest evidenced in Rhodesian copper deposits—Lena Goldfields "nationalized."

Oliver Iron Mining Co. plans third unit for Hibbing crushing and screening plant.

Payment of dividend on Federal preferred stock opposed by Content & Co.

Merger of Consolidated Lead & Zinc Co. and Underwriters' Land Co. assured; will be largest producer in Tri-State district—Childress enlarges holdings—Andrew mill, Crestline, Kan., destroyed by fire.

Mineral production of British Columbia in excess of $60,000,000 in 1925, an increase of 25 per cent over the total of 1924.

Tonopah Extension apex suit postponed until June 14—Rail service for Contact, Nev., assured—Tonopah Mining Co. secures option on Colorado Grande at Gold Circle.

Decline in production from Tonopah district, in Nevada.

Asbestos merger in Canada now being financed—Developments of slate deposits in Nova Scotia—Lead deposits at Arnprior, Ontario.

The Livingston Mines Corporation is developing high-grade ore for new mill in Idaho.

Coeur d'Alene Dividends for 1925 Totaled $6,333,000

Bunker Hill Leads With $2,943,000—Federal M. & S. Earnings Much in Excess of Dividends

Dividends paid by mining companies operating in the Coeur d'Alene district, Idaho, in 1925 amounted to $6,333,000. Bunker Hill & Sullivan topped the list with $2,943,000, a record that has been excelled only once in the history of the mine, and that was in 1906, when the company paid $3,480,000. The disbursement last year brings the total dividends paid by the Bunker Hill & Sullivan up to $33,777,000. Hecla Mining paid an even $2,000,000, which has never been excelled in its history, making the grand total paid by the company $14,105,000. Federal Mining & Smelting paid its regular quarterly dividend of $1.75 per share on preferred stock throughout the year, amounting to $840,000, bringing the total paid on preferred and common stock up to $22,303,782. Actual earnings of the company in 1925 were far in excess of its dividends, a fact that was strikingly brought out since the first of the year.

On Jan. 6 the Federal company declared a dividend of $19.25 per share on preferred stock and $10 per share on common, covering all accrued dividends on preferred and paying on common for the first time since 1909. This disbursement amounts to $2,310,000 on preferred and $600,000 on common, or a total of $2,910,000. To this is also added $210,000 covering the regular dividend for the first quarter this year.

The Hercules Mining Co. closed down about the first of 1925, and it is estimated that the company paid $300,000 in dividends for the year. Dividends from leasing and other operations are estimated at $250,000, making the total for the year $6,333,000. Other productive mines operating during 1925, but which paid no dividends, are the Tamarack & Custer, Success, Sunshine, Constitution, and Highland-Surprise.

Teck-Hughes Richest Gold Mine in Canada

TECK-HUGHES, of Kirkland Lake, Ont., is making new mining history, and is now treating ore of the highest average grade of any gold mine in Canada. According to official information, it would now be possible to operate the present mill at full capacity on ore carrying at least $40 per ton. It is only by drawing nearly two-thirds of milling ore from development and regulating the balance in such a way as to make the average grade uniform that heads are being held to around $25 per ton.

Present indications are that a net profit of close to $15 per ton is being realized, this indicating a rate of $90,000 a month, or around $1,000,000 a year.

Tonopah Mining Co. Secures Option on Mine at Gold Circle

The Tonopah Mining Co. has taken a working option on the Colorado Grande property, at Gold Circle, Nev., and has installed a compressor and other necessary machinery for sinking a winze from the tunnel level. James Pike, formerly of Tonopah, where he was superintendent of the Jim Butler mine for many years, is in charge of the work.

Eight Assessments Sink Goldfield Deep Mines Shaft

Now Bottomed at 2,160 Ft.—Diamond Drill Used To Prospect Ahead —Continues in Dacite

The Goldfield Deep Mines shaft at Goldfield, Nev., is now 2,160 ft. deep, lacking 240 ft. of the total depth calculated as necessary by the management. To date it represents a cost of over $850,000. It is one of the largest shafts in the state, being 22¼ by 9¼ ft. in the clear, four compartments, and timbered with 12-in. timbers. The company has collected eight assessments of one cent each, and has just levied assessment No. 9. At the last sale date, fewer than 10,000 shares remained with the assessment unpaid out of a total of between 4,000,000 and 5,000,000 shares outstanding.

The Deep Mines project aims to open the downward extension of the ore-shoot which was so productive at higher levels. After passing through Milltown andesite and latite, the shaft entered the dacite at a depth 1,000 ft. from the collar. It has continued in the dacite, intersected by occasional tongues of andesite from that point to the present depth, except where it passed through the C. O. D. vein at 1,030 to 1,070 ft. vertical depth, and later on for about 275 ft. below the 1,675 ft. horizon, a vertical quartz vein continued in the shaft.

A diamond-drill hole is now to be sunk to prospect ahead to determine whether any large flow of water will be encountered, and also to give a cross-section of the ground still to be passed through. The work is in charge of A. I. D'Arcy and H. G. McMahon, who have stuck to it with great persistence for several years.

out of use, the right temperature can be determined by the use of a compass. The heat below which steel will not harden is known as the critical temperature and it also happens that at the same degree of heat, steel loses its magnetism and its power to attract the compass needle. A small pocket compass, such as can be procured from any hardware store at moderate cost, and a pair of tongs made from brass or other unmagnetic metal can be used to determine when steel has reached its critical temperature. The compass should be fixed on a stand close to the door of the furnace in such a way that the bars of steel can be passed backward and forward in front of the compass in horizontal direction.

"The needle of the compass will be deflected in one way or the other so long as the steel has not been brought up to the hardening heat. Remember, however, that if the needle remains stationary at the first trial that it does not follow that the heat is right, because the steel will lose its magnetism as soon as it reaches the critical temperature and it may be too hot. A little practice will soon enable an operator to determine with this method exactly when the right temperature for quenching has been reached.

Tempering Should Not Be Done at Forging Heat

"Hardening should never be done at the forging heat. A very good practice is to give the bits a partial annealing by placing them as soon as forging is completed in a box filled with lime, covering them over, and leaving them in the lime until cold.

"Harden the bits, that is, quench them while the heat is rising, never while it is falling. The bits should be arranged in the furnace in such a way that, whenever one is withdrawn for quenching, those remaining in the furnace are moved up toward the place where the temperature is the highest, the new bit taking its place at the end of the line. The critical temperature below which drill steel will not harden is about 1,375 deg. F., and it must be remembered that a certain amount of heat is lost during the passage of the bit from the furnace to the quenching tank; consequently, the temperature of the furnace must be maintained at a point sufficiently above the critical temperature to take care of this fall. Bits must be heated evenly all through, but never any further back than is necessary. If the center is not the same temperature as the corners, it will flatten out and impede the cutting. The proper temperature at which to keep the hardening furnace is 1,450 to 1,500 deg. F. As soon as the bits reach this temperature, they should be withdrawn and plunged vertically in the water.

Vanadium Steel Requires Longer Heating

"Vanadium drill steel should be heated 25 per cent to 50 per cent longer than straight carbon steel.

"The quenching tank should be provided with an inlet at the bottom, and an overflow just below the top. It is best to have a continuous strong flow of water through the tank, so that it can be kept constantly cold, for if the water is allowed to become heated the bits will not properly harden. A wire screen should be placed about ¾ in. beneath the surface of the water, unless an automatic arrangement for tempering, as described hereafter, is installed. Be careful to see that the drills stand perfectly straight, so that they will not harden to a greater depth on one side than on the other. When cold withdraw, and temper by permitting the heat left in the body of the drill to run out of the cutting edges. A little experiment will show how long the drills must be left in the water to produce the right temper. Color to which drills should be drawn can be varied somewhat as the conditions of the ground demand. It is necessary to pull the drills from the quenching tank before they are cold.

"When water is scarce, instead of introducing a constant stream, run a pipe from the airline to the bottom of the quench tank. This will keep the water constantly agitated, and will prevent its heating up too rapidly.

"Automatic tempering is desirable wherever possible. An apparatus can be made with a rotating platform placed beneath the surface of the water, at an angle in such a way that a portion of the platform, when it is highest, is just below the surface of the water. Above and joined to the platform is a framework built to hold a number of drills in upright position. A drill placed on this platform at the highest point is carried as the platform revolves around the tank, getting gradually deeper in the water, until it gets to the opposite side, after which it gradually emerges. The best of such an arrangement is the uniformity in tempering which it gives. The depth of submersion in the water can be arranged to suit the requirements. This gradual submersion of the steel in the water produces a blending of the hardened and unhardened portions of the steel, which adds to its strength.

"Shanking should not be done at one operation. Form the collar at one heating and the finishing of the shank and lug in another. After the shank is completed, place the steel in the furnace and reheat to the forging heat; then place in an iron box and cover over with powdered lime and allow to cool off slowly. After this, reheat to 1,450 deg. F. and immerse the shank in oil. Great care must be taken to see that the steel stands perpendicularly, permitting the oil to come to ¼ in. above the lug. The temper of this shank should then be drawn by reheating. The extent of this reheating will depend a great deal on the type of machine used and the hardness of the rock which is to be drilled. If the shank shows a tendency to be brittle, it might be desirable to draw the temper to about 600 deg. F.

"The end of the shank must be kept square and smooth, with the edges slightly rounded.

"After tempering, each piece of steel should be carefully inspected before it is sent to the drills, to make sure that the bit and shank have been properly formed, that the gage of the bit is of the correct size, and that it has been properly hardened and is free from cracks or any imperfections which might result in breakage.

"The shank end of the drill steel must be ground off square, for, if not, the hammer of the drill cannot deliver a direct blow and if the blow is transmitted through a part which is not in direct alignment the effect is the same as the operating of an engine with a bent piston rod. For the same season the end of the striking blow or hammer in the drill must be ground off square and smooth, and must not be allowed to become hollowed out.

Summary of Directions

"In concluding, we may summarize in saying:

"1. Discourage the practice of operating with a dull bit, and remember that the only reason drill steel will drill rock is because of the cushioning effect of penetration at every blow delivered.

"2. To harden successfully, plenty of time must be given to the heating. Always leave the steel in the furnace long enough to insure its being heated uniformly and thoroughly. This may be best accomplished in a slow fire, and only by slow uniform heating is it possible to secure the required uniformity in hardness.

"3. Never heat either the bit end or the shank end, preparatory to forging, higher than 1,750 deg. F. This may mean a little more work on the part of the blacksmith, but the gain in quality of the finished drills will easily offset the slightly additional expense in forging.

"4. After hardening and tempering either bit or shank always quench at the critical temperature on the rising heat.

"5. Overheating a piece of steel preparatory to forging produces coarseness of structure which cannot be restored or refined by merely allowing it to cool and then subjecting it to a tempering operation.

"6. The degree of hardness that may be given to the cutting end of a rock drill bit is determined by the conditions of the ground under which it has to work, and when a bit is quenched at the critical point the degree of hardness may be varied by varying the rate of final cooling.

"7. When tempering shanks do not overlook the fact that density and toughness provide wear-resisting qualities, and that hardness, except on the extreme outer surface, is not essential or desirable. Subject the part for a distance of 2 in. below the lugs or collar to the heat treatment.

"8. Keep the chuck bushing up to size and remember that the worn end of a chuck bushing will prevent the transmission of a square, direct blow. This same treatment will apply to the size of the drill shank.

"Go slow. Keep your heat down; for 95 per cent of the trouble with drills underground is the result of overheating in forging or in tempering, or both."

Production in Tonopah District Decreasing

Tonopah Mining Leading Shipper—Tonopah Ex and West End Outputs Decrease

Tonopah production for the month of December was below normal. The Tonopah Mining Co. is now the largest shipper of bullion in the district, averaging around $100,000 per month. However, its bullion includes production by the Tonopah Belmont and much other custom ore. Monthly tonnage from all sources will average about 5,000 tons.

Tonopah Extension production continues to decrease. In November this company shipped $75,173.30 worth of bullion, with an operating loss of $31,078.38 for the month. There is a lack of facts regarding the condition of this mine, which with reduced production has acted as a damper on the entire Tonopah district.

West End operations are below normal. This company is shipping 75 tons of ore per day, producing from $30,000 to $35,000 worth of bullion per month. Drifting to the east in Tonopah "76" ground, on the "76" vein, has disclosed additional ore in virgin territory. Values are not sensational, but the vein is large and the precious-metal content appears to be increasing to the east.

A raise, for the joint benefit of the Tonopah "76" and the West End Extension, is being driven from the 1,200 level of the Tonopah Extension, for litigation purposes, and to prove continuity of the vein between the 1,200 level of the Tonopah Extension and the 800 level of the Tonopah "76" and West End Extension companies. This raise has over 200 ft. to go to be completed. West End has discovered an undeveloped orebody in MacNamara leased ground, in promising territory, and has already shipped 200 tons of ore which will average $25 per ton.

Tonopah Divide is still conducting an energetic campaign of development in its Tonopah Midway property, with no commercial values reported. The vein on which work is now being done, supposedly the eastern extension of the Murray vein of Tonopah Extension, has been proved to be very large, but so far low in grade. This company is now receiving substantial royalties from leaser operations in its Tonopah Divide property.

Hawthorne 200-Ton Flotation Plant Near Completion

A new 200-ton flotation plant being installed for the Hawthorne Mines, Inc., at Lucky Boy, near Hawthorne, Nev., is practically completed. The crushing unit is capable of handling 400 tons per day.

J. B. Kendall is now superintendent of the mine, in which work is conducted off the 6,400-ft. main haulage tunnel, and a considerable tonnage of mill ore available for immediate use is reported. The tunnel is a crosscut for the first 4,500 ft. and roughly follows the vein fissure the rest of its length, with the face showing ore. The principal formations in the district are limestone, quartzite, granite, and andesite.

One Hundred Per Cent Safety Record

THE Duluth plant of the Universal Portland Cement Co. operated the entire year in 1925 without having an hour's time lost on account of accidents, according to B. F. Affleck, president of the company. Plants in other cities produced similarly good results.

During the month of December a 100 per cent safety record was achieved at all plants, no time being lost anywhere because of accidents. The significance of this record is revealed when one recalls that thousands of men are employed day and night operating burning, crushing, and grinding machinery, elevators, conveyors, cranes, packing machines, and electrical apparatus required in making about sixty million sacks of cement a year.

Tonopah Apex Suit Postponed Until June 14

Trial of the apex case between the Tonopah Extension Mining Co., plaintiff, and the West End Consolidated Mining Co., for its subsidiaries, the Tonopah "76" Mining Co. and the West End Extension Mining Co., defendants, has been postponed to June 14, 1926, by stipulation between attorneys for the two companies. The delay resulted from necessity for further development work before geological conditions can be determined for proper presentation in court. Action was brought by the Tonopah Extension Co. to prevent the West End from following the "76" vein, whose apex, it claims, crosses the Tonopah Extension side line.

Dividends on Federal Common Halted by Injunction

Opposition has developed in connection with the payment of a dividend of $10 a share on the common stock of the Federal Mining & Smelting Co. H. Content & Co., representing themselves and others as holders of the preferred stock, filed application in the Court of Chancery at Dover, Del., for an injunction restraining directors from declaring the dividend. The opposition is based upon the belief that the charter of the company provides that a reserve equal to $100 a share should be set up for the purpose of providing for the preferred stock in the event of liquidation.

F. H. Brownell, president of the Federal company, at the time of the announcement of the dividend on the common stock, together with a dividend of $19.25 a share, clearing up all back dividends due on the preferred, issued a detailed statement. The question of the legality of the payments was raised at that time, but Mr. Brownell said that "your management at that time was advised by counsel that such dividends could be properly paid, and they were paid so long as, in the opinion of your board of directors, the earnings justified their payments."

Consolidated Lead & Zinc and Underwriters' Land Merge

Eagle-Picher a Part Owner—The New Group Will Be Largest in Tri-State District

The completion of one of the most important mining consolidations in the Joplin-Miami district in many months, that of the Consolidated Lead & Zinc Co. and the Underwriters Land Co., will be effected on Jan. 28, unless some unexpected developments occur. It had been expected that the transaction would be finally closed on Jan. 1, but at the last moment it was discovered that the laws of Delaware, under which the consolidated company is incorporated, require a thirty-day publication notice to stockholders for approval of mergers. Consequently, there is to be a meeting of stockholders on Jan. 28 to vote official approval for the consolidation to be effective as of Jan. 1. In the meantime the different companies are continuing operation in the Joplin-Miami district under original management.

It is estimated the value of the mines directly affected by the merger is approximately $2,500,000. The new concern will have options on other properties of approximately equal value. These options include the Tulsa-Quapaw Mining & Investment Co., the Domado Mining Co., the Baby Jim Mining Co., and also the royalty interest of the Wright Mining & Royalty Co. and of the Tulsa-Quapaw Co. The Eagle-Picher Lead Co. holds the majority interest in the Underwriters Land Co., and the minority interest is owned by officials of the Eagle-Picher Co., F. N. Bendelari, of Joplin, president of the Underwriters and a number of Cleveland capitalists.

The Underwriters company owns four large mills and is one of the veteran successful companies in the district. It was formerly managed by A. E. Bendelari, now vice-president and treasurer of the Eagle-Picher Lead Co., and a brother of F. N. Bendelari, who succeeded to the management of the Underwriters when A. E. Benlelari went with the Eagle-Picher company, about ten years ago.

The Consolidated Lead & Zinc Co. was organized just a year ago, it being an amalgamation of the Grace B. No. 1 and No. 2, the H. T., and the La Salle mines. T. C. Curry is president and George W. Potter, of Joplin, secretary and treasurer. Potter is agent for the Eagle-Picher Co. in this field and in charge of its mines. Though it cannot be said as yet whether the options owned by the new concern will be taken up, it is believed that at least several of them will be. The Consolidated has eighteen drill rigs in operation proving them up.

Mines included in the merger, and those optioned, produced approximately 76,000 tons of zinc concentrate and 13,000 tons of lead concentrate in 1925. Thus if the complete plan should go through it would make the new Consolidated the largest single producing company in the Joplin-Miami field, an honor at present held by the Federal Mining & Smelting Co. The name of the new company will be the Consolidated Lead Co.

Dixie Mining Corporation Organized

Lead and zinc mining will be resumed in Greene County, Mo., as a result of the organization of the Dixie Mining Corporation, of Springfield, Mo. The company owns 1,165 acres of mining lands in Greene County, valued at $99,209.

Prospectors Rush to Red Lake District, in Ontario

The rush of prospectors to the Red Lake gold area of Patricia, Ontario, is increasing, notwithstanding the rigors of the season and the hardships involved. In addition to the parties sent out by established mining companies, syndicates in Toronto, Winnipeg, Haileybury, and other places are fitting out expeditions. Some difficulty is reported in securing dog teams for the journey, which has been a cause of delay.

The records of the North Bay office of the Ontario Department of Mines show that upward of 300 mining claims have already been recorded in the Red Lake mining district. Claims have been recorded in a continuous chain 10 miles long from east to west and covering a strip of about two miles in breadth.

Lead Deposits Discovered Near Arnprior, Ontario

In addition to the discovery and development of extensive lead deposits near Arnprior, Ontario, the Ottawa Valley Mines Syndicate has secured near Carelton Place, in the Ottawa valley, mining rights on nearly 1,000 acres of property upon which rich deposits of lead have been discovered. Diamond drilling is to be begun immediately by the Ontario Diamond Drilling Co., of Sudbury.

Metallurgical Industry of Lorraine Satisfactory

With forty-six blast furnaces in operation out of a total of sixty-six, the condition of the metallurgical industry of Lorraine, France, remains fairly satisfactory, with the monthly production of active furnaces totaling 300,000 tons of pig iron, according to advices to the U. S. Department of Commerce. Foreign and domestic demand continues lively, with rolling mills and steel plants well supplied with advance orders. Deliveries can only be made in from two to six months.

Alaska Juneau in December

Alaska Juneau Gold Mining Co. mined and trammed 281,500 tons in December, 1925, yielding $177,000, or 62.88c. per ton. Operating expenditures were $143,800, or at the rate of 51.08c. per ton; operating profit was $33,200, or 11.80c. per ton. Other expenditures and accrued charges totaled $42,750, leaving a deficit for the month of $9,550.

Additions to the milling plant are reported to be about 66 per cent completed and the Ebner preliminary work is about 64 per cent completed.

Mines at Contact, Nev., to Have Direct Rail Service to Smelters

THE Oregon Short Line Railroad between Rogerson, Idaho, and Wells, Nev., will begin service on Feb. 15. This road will give a direct outlet for ore from the region served, to Utah smelters, being of special benefit to the mines at Contact, 38 miles south of Rogerson.

It is reported that the Gray Mining Co., which owns and operates the principal copper mine at Contact, is about to start construction on a large power plant to supply the district with electric power. Prospecting along the section adjacent to the new road has already become active.

Pioche District, Nev., Making Regular Shipments

Development work continues at the Prince mine and in the adjoining Virginia Louise workings in the Pioche district, in Nevada. Fifty-five men are employed, and a reduced tonnage of ore is being shipped from the Virginia Louise mine. During the last week in December 1,500 tons of ore was shipped to Utah smelters and mills from the Pioche district, the production being twenty-one cars from the Combined Metals mine, four cars from the Black Metals mine, and six cars from the Bristol Silver mines. Outside properties under development include the Lucky Tom mines, about 75 miles northerly from Pioche, where high-grade silver-lead-copper ore is being opened up on the surface. At Mount Irish the Brownlow holdings are showing up well, and a large tonnage of milling ore is being developed.

In spite of the high price of lead, the smaller properties are for the most part not shipping, but much development work is being done which should show favorable results during the new year. The larger properties still maintain steady shipments of ore and are being greatly benefited by the higher metal prices.

Ceramics Course at Missouri School of Mines

A department of ceramics will be added to the Missouri School of Mines and Metallurgy at Rolla, Mo., it was announced Dec. 31, 1925, following a meeting of the executive committee for the School of Mines and Metallurgy of the Board of Curators of the University of Missouri.

The need for such instruction in the handling of clay at a school situated in the center of one of the largest clay-producing areas in the United States has been felt for a long time, according to C. A. Fulton. A committee composed of representatives of the clay industry in Missouri was responsible for bringing the matter before the curators of the Missouri School of Mines and Metallurgy.

Buckeye Mine Ships One Car Per Day

Sheldon & Kuusinen, operating the Buckeye mine, at the old camp of Brandon, two miles from Twin Bridges, Mont., are said to be shipping about one car per day to the Timber Butte Milling plant, in Butte. The ore is a zinc-lead sulphide in quartz.

Foreclosure Sale of Virginia-Carolina Chemical Co.

Federal Judge Runyon, in Newark, N. J., recently granted a motion to authorize the foreclosure of a $35,000,000 first mortgage, held against the Virginia-Carolina Chemical Co., now in receivership, by the Central Trust Co. of New York, in behalf of the bondholders. He also authorized the sale of the fertilizer and phosphate plants of the company in eighteen federal court districts, appointing George Bryan, of Richmond, Va., as a special master to have charge of the sales. He accepted the annual report of the receivers, which accounted for claims of $40,000,000 against the concern and set Feb. 5 as the date for a hearing.

The Virginia-Carolina Chemical Co. went into the hands of receivers on March 1, 1924. It is a new Jersey corporation capitalized at $300,000,000.

Iron Mines at Fierro, N. M., Operating Continuously

The Hanover-Bessemer Iron & Copper Co. operated continuously at Fierro, N. M., throughout 1925, supplying the hard ore requirements of the Colorado Fuel & Iron Co. An installation of crushers and picking belts was completed at the end of the year, so that in the future the ore will be crushed and shipped in proper sizes required for blast-furnace operation.

Webster Nickel Deposit, in North Carolina, Under Examination

J. Saylesburg, of Pebenburg-Elms, Germany, is in North Carolina, and plans to investigate a nickel ore deposit near Webster, Jackson County. Whether the Jackson County deposit is sufficiently rich to warrant development is considered doubtful by Mr. Saylesburg. To mine nickel profitably, it is necessary that the metal content be at least 4 per cent, he said, and his information is that the Webster mine assays only 1 per cent. Mr. Saylesburg operates a nickel industry in Germany.

Standard Soapstone Establishes Office at Arrington, Va.

Certificate of authority has been issued to the Standard Soapstone Corporation, of New York. The principal office of the corporation in Virginia is to be at Arrington, with Michael J. Copps in charge. The corporation, which is capitalized at $1,500,000 preferred and 15,000 shares of common stock, of no par value, will quarry, manufacture, and prepare for the market soapstone, stone, and building materials.

Mining an old river bed for gravel, near Crushton, Calif., at the new plant of Union Rock Co.

Livingston Mines Opens High-Grade Lead-Ore Deposit

Flotation Mill of 300 Tons' Capacity in Operation—Mine 65 Miles From Railroad

Newspaper accounts have heralded wonderful statements regarding the recent discovery of lead ore in the Livingston mine, Custer County, Idaho. It appears, however, that this is only the downward extension of a known orebody, but information obtained from an altogether dependable source, though conceding that newspaper reports are greatly exaggerated, describes the Livingston strike as the most important that has occurred in southern or central Idaho in many years. The ore is said to be 38 ft. wide and is described as a high-grade, fine-grained galena, carrying no zinc, and containing some silver. The ore was struck in No. 7 tunnel, which is approximately 600 ft. below No. 6 on the dip, but which has attained a depth of only about 200 ft. from the surface vertically. Sufficient development work has not been done upon which to base an estimate of tonnage, although it is enough to show that it is of great importance, especially in view of the favorable geological conditions, both as to the character of the mineral deposit and the inclosing rock formation.

Aside from the recent strike in No. 7, the main development on the Livingston is No. 6 tunnel, 600 ft. in length and having ore for practically the entire length. A "jigback" tramway 1,000 ft. long delivers ore from No. 6 to a station near No. 7, from which it is delivered three miles by tramway to the mill of 300 tons' capacity, and treated by concentration and flotation. This mill was completed in 1925 at a cost of $150,000. The mill is driven by electric power, developed by the company's own hydroelectric plant. This plant also supplies power for a 12x14 Sullivan and 10x10 Ingersoll-Rand compressor, which will soon be supplanted by a new compressor of large capacity. During the last year twelve Mack trucks were purchased for delivery of ore to the railroad at Mackay; a new bunk house was completed and five new residences. The road to Mackay, 65 miles distant, is an excellent highway, 20 miles of which is maintained by the state and 30 of which is a new road through Peck Canyon, constructed by the Livingston company. Ore from the new strike is being shipped crude as well as in the form of concentrate.

The Livingston Mines Corporation is capitalized for 3,000,000 shares of the par value of $1. According to the last annual report of the company, 2,021,000 shares were issued. The main office of the company is at 25 Broad St., New York. A. W. Walker, of New York, is president, and Frank Shaffer, also of New York, is secretary. J. B. Stewart, of Mackay, Idaho, is manager. Mr. Walker is understood to represent the controlling interests in the company. It has been repeatedly published during the last year and also since the recent strike that control of the Livingston company was owned by General Motors. This is not true, although it is probable that certain prominent stockholders in General Motors are stockholders in the Livingston.

Calumet Lead Mine, Near Pembroke, Ont., to Be Developed

The James Robertson Co., Ltd., owners of the Kingdon Mining, Smelting & Refining Co., has acquired the Calumet lead property, in Quebec, in the neighborhood of Pembroke, Ont., and located close to the Waltham branch of the Canadian Pacific Railway. The company is planning to develop the deposit on a large scale and is negotiating with the Consolidated Mining & Smelting Co. of Canada, which recently acquired the smelter of the British America Nickel Co. at Deschenes, Que., for the treatment of ores and concentrates from Calumet.

Copper King Mine, Near Hillside, Ariz., to Be Re-worked

Following several years of idleness, the Copper King mine, 45 miles northwest of Hillside, Ariz., is to be reopened. Copper King ore is rich in zinc and carries in addition copper, silver, and lead. During the war a large tonnage was shipped from the property. Within a short time ore will be ready for shipment to the Guggenheim zinc smelter at Amarillo, Tex. A. M. Gillespie is general manager.

Mineral Output of British Columbia in Excess of $60,000,000

The last year has been one of unprecedented prosperity for the metal mining industry in British Columbia, unmarred by labor disputes. Valuation of the mineral production in 1925 was $61,491,600, which is an increase of about 25 per cent over that of 1924. The only metals to show decreases are gold and silver, the latter being slight. The decrease in gold output is due to the closing of the Consolidated Mining & Smelting Co.'s Rossland mines, after a year of unprofitable operation, early in the year. During 1924 these mines produced 42,000 oz. of gold.

Following is a detailed estimate of the mineral output; the output for 1924 is given for comparison:

	1925	1924
Gold, oz.	233,460	268,753
Silver, oz.	7,303,755	8,341,768
Copper, lb.	71,803,000	64,845,393
Lead, lb.	236,408,000	170,384,481
Zinc, lb.	97,222,000	79,130,970
Miscellaneous	$3,000,000	$2,833,672

The sharp rise in the lead and zinc outputs of the province during recent years has attracted the attention of some of the large interests, which have sent engineers to make examinations. This has resulted in the Federal Mining & Smelting Co. acquiring a 55 per cent interest in Atlin Silver Lead Mines, in consideration for the Federal company's undertaking to bring the mine to the producing stage, at an estimated cost of $600,000. The same company has purchased the Sally mine, in the Boundary district, for $540,000; Reno Gold Mines, in the Nelson division, has been acquired by San Francisco interests for $250,000; and a majority interest in Bush Mines, controlled by National Silver Mines, has been optioned by the Sebakwe Corporation for a consideration of 600,000 shares in the company. Leases and options of the Galena Farm mine, at Silverton, in the Slocan, and the Goodenough mine, near Ymir, in the Nelson division, have been acquired by Porcupine Goldfields Development & Finance Co. Consolidated Mining & Smelting Co. of Canada and the Howe Sound Co. have advantageously exchanged their bonded indebtedness for capital stock.

Among the outstanding events of 1925 are the completion of the new smelter at Trail whereby the capacity of the lead plant has been increased from 190 tons to 350 tons per day and that of the zinc plant from 100 tons to 200 tons per day; the addition of 40,000 hp. to the West Kootenay Power & Light Co.'s plant at Bonnington Falls and 22,500 hp. to the East Kootenay Power Co.'s plant at Elko and Bull River, chiefly for mining and metallurgical purposes; the restarting of the Allenby Copper Corporation's mine and mill; the successful operation of Kafue Copper Development Co.'s dredge in the old Caribou district, which since the latter part of August has been dredging 60,000 to 70,000 yd. of gravel per month at a cost of about $6,500 and with a production of approximately $20,000 in gold; and the erection of a 500-ton concentrator to treat the old dump at the St. Eugene mine, at Moyie.

Washington News

By Paul Wooton
Special Correspondent

Advocate Federal Aid for Potash and Manganese Development

Foreign Control Agitation Arouses Interest—Senator Sheppard Wants Funds for Prospecting

One of the recommendations likely to come from the Congressional investigation of foreign control of raw materials is that more federal support be given studies looking to increased domestic production of certain materials. Though there is little prospect of producing rubber or tin in American territory, it is well within the range of possibility to decrease our dependence on foreign potash and manganese, for instance.

Senator Sheppard, of Texas, the autor of the bill proposing large expenditures in prospecting for potash in the "Red Beds" of the Southwest, believes that such a recommendation would do much to alter the attitude of the President and the Director of the Budget, who have been unwilling to endorse his measure because of the expenditure involved. With all the geological evidence pointing to the existence of extensive deposits of potash and with its actual occurrence, in small quantities, proven at numerous points, he believes prospecting should be undertaken in earnest, if the administration is serious in indicating the importance it is attaching to this matter.

Members of Congress from states with manganese resources are known to be ready to urge additional appropriations for research looking to the recovery of the manganese in the iron ores of Minnesota and Michigan and to the development of methods whereby the high-grade ores of Montana, California, and Washington and the residual manganese deposits of Arkansas and Virginia can be mined profitably.

Bill Would Limit Placer Locations in Alaska

Modification of the mining laws in their application to Alaska is proposed in a bill introduced in the House of Representatives by Delegate Sutherland as follows:

"That no person shall hereafter locate any placer-mining claim in Alaska as attorney for another unless he is duly authorized thereto by a power of attorney in writing, duly acknowledged and recorded in any recorder's office in the judicial division where the location is made. Any person so authorized may locate placer-mining claims for not more than two individuals or one association under such power of attorney, but no such agent or attorney shall be authorized or permitted to locate more than two placer-mining claims for any one principal or association in any one recording district during any calendar month, and no placer-mining claim shall hereafter be located in Alaska except under the limitations of this act.

"That no person shall hereafter locate, cause or procure to be located for himself more than two placer-mining claims within any one recording district, in any calendar month: Provided, that one or both of such locations may be included in an association claim."

New Record for Fast Hoisting in Joplin-Miami District

A NEW hoisting record is announced from the Joplin-Miami zinc-lead district, where workers at the Acme Lead & Zinc Co. mine hoisted 1,119 "cans," 30 by 30 in. in eight hours. The "ore" was pulled a distance of 215 ft. A Freeman first-motion hoist was used. R. Laws was hoisterman and J. Smith, hooker. On Jan. 4, 1923, the Acme mine hoisted 1,060 "cans" in eight hours, pulling it 266 ft., and in April, 1922, a crew at the Black Hawk mine hoisted 1,068 "cans" in the same time, 296 ft.

Polish-Silesian Iron Industry 30 to 50 per Cent Normal

The general situation in the Polish-Silesian iron and steel industry, most of whose units are operating from 30 to 50 per cent of normal, shows no improvement, and in some cases has taken a turn for the worse, according to the U. S. Department of Commerce. Credit shortage continues, and large amounts of commercial paper are going to protest. The industry, being obliged to buy its raw materials on a gold basis, has suffered a loss of about 20 per cent through the fall of the Polish zloty. Little difficulty is being experienced in the matter of obtaining iron ore; in a recent month about 30 per cent of the total requirement was supplied by Polish mines, the remainder coming chiefly by Russia, with lesser amounts from Sweden, Germany, and North Africa.

Blast furnaces, steel mills, and rolling mills in general are suffering from declines in German demand owing to the Polish-German tariff difficulties, and from French, Belgian, English, and German competition.

Leadville Tonnage 33 Per Cent Ahead of 1924

The American Smelting & Refining Co., with smelters at Leadville and Durango, Colo., gave out some figures recently showing that the plant at Leadville is 33 per cent ahead of last year on tons of ore treated, and the Durango plant is about 20 per cent ahead. The increment is attributed to the reopening of some old mines, market demands, and the improved processes used. For the first nine months of 1925, Leadville produced 178,045 tons of ore, while in 1924 the entire year's production was 170,002 tons. At Durango, the comparison is 52,454 tons for the first nine months of 1925, while the whole year of 1924 it was 55,745, and based on that proportion the 20 per cent increment is practically sure.

Johannesburg Letter

By John Watson
Special Correspondent

Marked Increase in Prospecting Permits in 1925

Modder Deep Leads in Low Costs—Government Areas First in Output—Gold Shares Remain Steady

Johannesburg, Dec. 8—The following results, for the month of November, from fourteen leading gold mines of the Rand, have just been published. They are arranged in order of profits:

	Tons Crushed	Revenue or Value	Costs per Ton Crushed s.	d.	Estimated Profit
Government Areas.....	157,000	£302,216	17	0.9	£171,160
New Modder.	126,000	270,230	17	3.4	161,315
Crown Mines.	206,000	279,420	19	0.3	83,494
Modder Deep.	42,500	96,078	15	3.0	63,634
New State Areas.....	69,000	126,909	20	6.4	56,403
Springs.....	65,000	121,996	20	3.0	56,176
Brakpan.....	82,000	131,218	19	1.0	52,980
Van RynDeep	65,000	104,945	16	10.2	51,002
Modder B....	64,000	110,042	19	3.7	48,250
Geduld.....	80,000	117,251	17	5.0	47,540
City Deep....	99,000	153,212	22	1.8	43,547
Randfontein..	180,500	191,686	17	9.5	33,805
West Springs.	45,500	70,546	17	8.0	30,346
Robinson Deep	69,300	.....	17	8.8	25,100

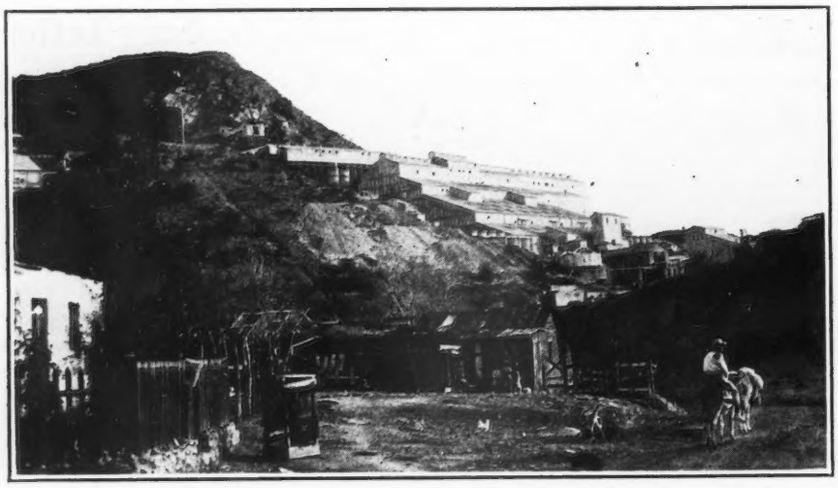
There was a marked increase in prospecting operations for base metals in 1924, and this activity is still maintained. Last October, the prospecting permits held numbered 3,082, compared with 2,920 for September; at the end of last June, 1856, and at the end of December, 1924, the number was 807. Prospecting claims held in October numbered 53,022, and the number of diggers claims reached 15,481; base-metal claims show an increase from 42,583 at the end of 1924, to 101,056 on Oct. 31.

"The activity," says the mining editor of *The Star*, "has been most marked in the Pietersburg district, where the total claims held at the end of October numbered 71,607 out of a total of 169,559 for all of the Transvaal. This total is nearly three times the figure at the end of 1924 (24,882) and the base-metal claims alone account for 70,690 of last month's total."

On the Johannesburg Stock Exchange gold shares have remained steady during the past week. T. C. Lands have risen from 59s. 6d. to 69s. 6d. during the week ending Saturday. Reports from Onverwacht indicate better platinum values, in the pan, at 226 ft. depth, though assay results are not yet published.

Lead Ore Reported in Lanark, Ontario

The Ontario Valley Mines Syndicate has secured mining rights over nearly 1,000 acres of land in the neighborhood of Carleton Place, in Lanark County, Ont., upon which rich deposits of lead have been discovered. Examination by government geolgoists has proved the extent of the deposits, and their report shows assays of nearly 14 per cent metallic lead. Diamond drilling will be started early in January by the Ontario Diamond Drilling Co. of Sudbury, Ont.



A modern plant in medieval environs. The mill of the Phelps Dodge Corporation at Nacozari, Mexico

Mexico City Letter

By W. L. Vail

Special Correspondent

Revision of Mining Code Authorized by President Calles

Annual Development Work May Be Made Obligatory—La Noria Mill Ready to Run

Mexico City, Jan. 11—Orders have been issued by the Mexican Secretary of Commerce and Labor, having to do with mining matters, for a complete revision of all mining titles. President Calles was granted special authority before the closing of Congress to revise the mining code, and it is expected that a decree will be issued within the next ninety days putting into effect new mining regulations with some radical changes over the present legislation. One of the main departures anticipated is that owners of mining claims will be compelled to do a certain amount of development work in addition to payment of annual taxes. Regulatory measures are also expected which will be intended to discourage the holding of a large number of claims by single corporations. Many foreigners have large mining holdings in the republic, on which no work has been done in many years. In many cases they allege the turbulent condition of the country as an excuse, but as the country is now officially at peace it is not probable that the government will be disposed to take such allegations into future consideration.

The 200-ton mill at the La Noria property, in Zacatecas, backed by British capital, is reported completed. The management claims to have a reserve of 360,000 tons of ore, and is doing very little further development, preferring to await a few months for the mill returns. The owners are operating La Noria under a lease with G. C. Palmer, of Zacatecas.

Notwithstanding so called antagonistic foreign legislation, Mexico is flattering herself that she has recovered her former lead in silver production and is again holding fourth place as a gold producer, not to mention keeping in line with her copper, zinc, and lead output. It is also a gratifying fact to the government that a large part of the gold now mined in the country stays here. Prior to 1919 practically all the gold was exported, but since that period a liberal percentage has remained at home. For example: The production in 1919 was 23,586 oz., and only 6,224 was exported; in 1920, the mines produced 22,864 oz., and there was exported 7,255 oz.; in 1921 the production was 21,275 oz., and the export 6,951 oz.; in 1922 there was a production of 23,275 oz. against an export of 8,558, and in 1923 the output was 24,162 oz. and the export 8,353 oz.

Tin Represents 75 per Cent of Bolivia's Exports

Within the last year such favorable conditions have obtained in the world metal market, especially in that for tin, the London spot price of which is £287 per ton, that Bolivia, furnishing 28 per cent of the total annual tin output of the world, has experienced a period of unusual prosperity, says the U. S. Department of Commerce. Tin shipments alone account for approximately 75 per cent of Bolivia's exports in value, and are the source from which is derived most of the government revenues through the export tax imposed. Next in importance in exports are silver, copper, and rubber in the order named. Prices of silver and copper are sufficiently high to warrant continued activity in these industries, and the rubber operators of eastern Bolivia have been encouraged to renewed activities by the high prices of crude rubber.

Fire at Picher, Okla.

The compressor room of the Birthday mine, south of Picher, in the Oklahoma section of the Joplin-Miami field, was destroyed by fire early on the morning of Jan. 12. A new 1,000-ft. compressor and 200-hp. motor were lost, as well as the drill sharpener and electric transformers. The total loss was estimated at $12,000 by F. W. Evans, owner of the property. It was covered by insurance.

London Letter

By W. A. Doman

Special Correspondent

Lena Goldfields Gets "Nationalized" Concessions

Rhodesian Copper Attracting Much Attention—Americans Interested—Camp Bird Reorganization Delayed

London, Jan. 5—Lena Goldfields, Ltd., has issued a circular to its shareholders stating its present position. It appears that G. Benenson played an important part in obtaining the concession, which includes not only the former properties of the Lenskoie, Altai, and Sussertski mining district companies, but also the Revdinski district coal mines and other valuable property essential for the success of the concession. The above-named companies have been "nationalized"—in other words, seized. They have had numerous transactions, resulting in mutual debits and credits, with Mr. Benenson's companies, as also with Mr. Benenson himself and the Russian and English Bank. It is part of the terms of the concession that the Soviet Government will not be liable to make any compensation in respect of these transactions, and that the Lena company is to come to a settlement of them with Mr. Benenson and the various concerns.

Legal Questions Involved

The subject matter is one of considerable legal doubts and difficulty because of the position of Russian companies in this jurisdiction as well as in Russia. An issue of £750,000 8 per cent ten-year bearer notes convertible into shares has been purchased by G. Benenson & Co., which company has entered into other arrangements with the Rock Investment Co. Making all allowances, it is computed that the present shareholders will retain about 82 per cent of the properties and equity in the property. The Rock Investment Co. stipulates that it should become financial adviser for the next six years and have two directors on the board. Its remuneration as adviser during the six years will be "5 per cent of the profits actually distributed while the company is a going concern," or by way of distribution of surplus assets in a winding up, after repayment of the ordinary share capital, as well as A shares, treating them as worth £1 each. If, therefore, the Lena company is a going concern for twenty years, the Rock Investment would seem to have made a good bargain. The directors' remuneration is raised from £3,500 to £8,000 per annum, and they are to be entitled in certain circumstances to further remuneration up to £10,000. F. W. Baker, who has been a director for seventeen years, receives £3,000 compensation for loss of office.

Interest in Copper

At the beginning of 1925 it was hoped that copper would stand at a much higher level at the end of the year, but the price has not shown that tendency to rise which the market and

producing companies had expected. There can be no question of the interest which is being taken in copper, and in no respect is this interest greater than in regard to the Rhodesian deposits. It would appear that since new life was infused into the British South Africa Co., increased activity has been witnessed in connection with prospecting.

CONTINUATION OF KATANGA?

Favorable indications have been discovered in various parts and as, according to large scale maps, the theory is held that some of these Rhodesian deposits form the continuation of the Katanga copper area, there is naturally every inducement to carry out energetic prospecting to test the theory. An interesting feature of the whole Rhodesian business seems to be the concentration upon copper by some of the "livest" financiers and experts. It is hardly to be expected that they would have not only invested their own capital in these areas, but made themselves responsible to the public for other capital, unless the prospects warranted such faith and responsibility. Some promising discoveries have already been made, and with the increase in activity more are expected during the current year, and it is noteworthy that American capital is seeking outlet in this direction.

RHODESIAN OUTPUT NOT LARGE

Although the actual production from the copper mines of Rhodesia during the current year may not be large, the picture at the end of the period will look far different than it does today. The last year has in fact been a more or less base-metal year, shares in tin, lead, and zinc properties having excited far more activity than gold-mining undertakings. Of course, with regard to the latter there are some exceptions, but as the price of gold does not vary in the same way as that of the base metals, and as there have been no large-scale increases of equipment, dividends have in no cases shown notable expansion. Much is anticipated in the near future of the tin market; and the silver-lead-zinc properties, chiefly Burma Corporation, Rhodesia Broken Hill, and the mines of the Barrier Range, are expected to come to the front.

CAMP BIRD REORGANIZATION DELAYED

The reconstruction plans of the Camp Bird have been much in the public eye of late on account of the better prospects for Santa Gertrudis and the Mexican Corporation. The directors' proposals, although accepted generally, have encountered a certain amount of opposition, and at the meeting held recently there was a hitch on account of the fact that a sufficient majority of proxies was not held by the board. This is due to the fact that bearer shareholders had not deposited their warrants. Between 600,000 and 700,000 proxy votes had been lodged, but as there must be a two-thirds majority of all class holdings, and this was not the fact, the proposal for reorganization could not be approved. An informal resolution was, however, passed by an overwhelming majority, accepting the proposed plan.

Gold Standard for India Has Backing

ADVOCACY by the Currency Commission of an effective gold standard as the soundest currency system for India is receiving the support of the leaders of economic thought in India, according to the U. S. Department of Commerce. The gold standard is eminently practicable, according to these leaders, since India has considerable resources of gold bullion and securities, with the balance of trade normally favorable. The immediate and total conversion of existing currency is not insisted on, but it is suggested that fresh additions to currency in the form of gold notes or gold certificates be made. It is also proposed to mint a gold coin of the same fineness and weight as a sovereign, to be known as a Mohur and made the gold-standard coin of the country.

Financing of Asbestos Merger Now Under Way

New financing arising out of the asbestos merger of companies operating in Quebec will, it is understood, be undertaken soon in the Canadian market. The Dominion Securities Corporation, associated with Dillon, Read & Co., of New York, will place an offering of $1,300,000 6 per cent fifteen-year first-mortgage and refunding bonds of the Asbestos Corporation, Ltd., entirely in the Canadian market. This is part of a $3,000,000 issue, $1,700,000 of which becomes available to holders of the Asbestos Corporation of Canada 5s. on an exchange basis bond for bond. This issue of $3,000,000 will be a first charge on all fixed assets, present and future, and a floating charge on the current assets of the Asbestos Corporation, Ltd., subject to prior mortgages on sections of the properties. These prior liens will be reduced in amount corresponding to the underlying bonds exchanged. Assets including asbestos deposits, mills, etc., will be shown in the balance sheet at values in excess of $20,000,000. The net working capital will not be less than $2,500,000. It is reported that the actual transfer of properties is under way and proceeding satisfactorily.

New Plant and Equipment on Mesabi Iron Range

A third unit will be added by the Oliver Iron Mining Co. to the Hibbing crushing and screening plant. Work will start immediately. This unit will duplicate in size the two others, and most of the equipment will come from a temporary crushing and screening plant built in the Hull-Rust pit three years ago.

New operating equipment for next season has been purchased by various mining companies on the Mesabi range. A new Model 125 Marion electric shovel will be placed by Pickands Mather Co. at the Mahoning pit, at Hibbing; and a duplicate machine at the Corsica mine near Gilbert. A Model 37 Marion electric shovel will be installed at the Biwabic mine at Biwabic. Fifty new 30-yd. dump cars were purchased by the Oliver Iron Mining Co. to be distributed to the Hibbing and Virginia districts for carrying ore from the pits to the crushing and screening plants. A majority of these will be the differential dump car, a sample of which was so thoroughly tested by several companies on the range last season and proved its ruggedness under all conditions of service.

Chronology, 1925

January

Jan. 1. The Union Sulphur Co., Calcasieu Parish, La., closed on Dec. 27, 1924, after thirty years' operation and production of 17,000,000 tons of sulphur by the Frasch process.

Jan. 6. Yukon Treadwell Mining Co. started 100-ton mill at Keno Hill, Yukon Territory.

Jan. 13. R. M. Catlin elected president of the Mining and Metallurgical Society of America.

Jan. 20. Fort Worth mill of the Childress Lead & Zinc Co., Picher, Okla., destroyed by fire.

February

Feb. 1. Coeur d'Alene, Idaho, mining companies increase mine wages 50c. per day.

Feb. 11. Euterpe Mining Co., Baxter Springs, Kan., lost mill by fire.

Feb. 16. Life-size bronze tablet unveiled to the late Dr. Rossiter W. Raymond at A.I.M.E. Headquarters, New York City.

Feb. 17. Ellis mill of Eagle Picher Lead Co., Crestline, Kan., destroyed by fire.—U. S. Circuit Court sustains George Campbell Carson in patent suit against A. S. & R. Co.

Feb. 19 Annual meeting of the American Institute of Mining & Metallurgical Engineers in New York City.

Feb. 20. Manganese concentrator of Phillipsburg Mining Co., Phillipsburg, Mont., destroyed by fire.

Feb. 23. Special meeting of stockholders of the Union Minière du Haut-Katanga to refinance by issue of 4½ per cent bonds and additional stock.

Feb. 24. Barytes plant of the Eagle Picher Lead Co., Mineral Point, Mo., destroyed by fire.

March

March 1. Plymouth Consolidated Mining Co., Amador County, Calif., placed in hands of receiver. Later sold to Argonaut Mining Co.

March 4. Canadian Mining Institute held annual meeting at Ottawa.

March 29. Cave-in at Commonwealth mine, Baxter Springs, Kan.

April

April 6. National Lead Co. purchased plant of Metallurgical & Chemical Corporation.

April 9. Shareholders of Consolidated Mining & Smelting Co. of Canada voted to redeem $3,800,000 bonds.

April 14. First meeting of American Refractories Institute held at Pittsburgh, Pa.

April 24. Fire on 2,000 level of Hecla Mine, Burke, Idaho, trapped fourteen men, released fifteen hours later.

April 27. American Zinc Institute held annual meeting at St. Louis, Mo.,

April 30. Strike at Boleo Copper Co., Santa Rosalia, Lower California, involving 4,000 men — Lena Gold Fields, Ltd., secured mining concession from Soviet Russia.

May

May 1. California high-grading bill became law.

May 7. British-America Nickel Corporation sold at auction for $5,000,000.

May 15. Quebec Government agreed to smelter site at Rouyn, Quebec.

May 18. Consolidation of Park-Utah, Park City Mining & Smelting, Ontario and Daly completed.

May 19. First shipment of zinc concentrate from Coeur d'Alene district, Idaho, made to Belgium.

May 21. Stewart Campbell, State Mine Inspector of Idaho, sued by Idaho Copper Corporation for damages as result of enforcement of "blue-sky" law.

May 22. Society of Economic Geologists held annual technical meeting in New York.

June

June 4. U. S. Bureau of Mines ordered transferred from the Department of the Interior to the Department of Commerce.

June 14 W. A. Harriman & Co., of New York, secured large Georgian manganese concession from Soviet Russia.

July

July 1. Bureau of Mines transfer from the Department of Interior to Department of Commerce effective—Consolidated Mining & Smelting Co. of Canada started first unit of refinery, using power from first 7,500-hp. unit of the West Kootenay Power Co.

July 4. Joplin mines closed for two to four-day vacation with surplus of ore in bins.

July 8. Fire destroyed large part of surface plant at Great Western Mine of McKinney Steel Co., Crystal Falls, Mich.

July 13. Silver Producers Association had hearing before Commissioner of Internal Revenue regarding revaluation of silver mines.

July 15. Stockholders ratify sale of White Caps Gold Mining Co., to White Caps Mining Co.

July 17. Mine managers, engineers and attorneys meet at Wallace, Idaho, to discuss revision of mining law.

July 20. Fiftieth anniversary of discovery of iron ore in St. Louis County, Minn., by Albert Chester and R. H. Lee, celebrated at Duluth.

July 20. Park - Utah Mining Co. absorbed assets of Park City Mining & Smelting Co., and assumed name of Park-Utah Consolidated Mines Co.

July 31. Anaconda Copper Mining Co. reorganizes mining operations at Butte to increase economy of production.

August

Aug. 1. Helium plant at Fort Worth, Tex., transferred from Navy Department to U. S. Bureau of Mines, Department of Commerce.

Aug. 7. Machinery storehouse of the International Nickel Co., Copper Cliff, Ontario, destroyed by fire.—Report on "Supply and Demand of Petroleum" issued by Committee of American Petroleum Institute for Federal Conservative Board.

Aug. 8. Judge Soper filed opinion in action of Wolf Mineral Process Co., vs. Mineral Separation (North American Corporation) in which complaint was dismissed.

Aug. 10. American Silver Producers Association convened at Salt Lake City for consideration of mine valuation and tax matters.

Aug. 11. Giant blast of 125 tons of black powder and 5 tons of dynamite set off at United Verde Copper Co.'s steam shovel pit, Jerome, Ariz.

Aug. 13. Annual meeting of Lake Superior Mining Institute held at Sault Ste. Marie, Mich., and Ontario.

Aug. 15. Allenby mill of Granby Consolidated Mining, Smelting & Power Co., British Columbia, ready for operation.

Aug. 24. Circuit Court of Appeals rendered verdict against Coeur d'Alene mining companies, in suit charging pollution of river water and rendering unfit for agricultural purposes.

Aug. 25. Mining Section of National Safety Council met at Hibbing, Minn.

Aug. 31. American Institute of Mining and Metallurgical Engineers held 132d meeting at Salt Lake City, Utah.

September

Sept. 1. Anaconda Copper Mining Co. announced 33⅓ per cent enlargement of Great Falls plant—Postponed meeting of stockholders of West End Consolidated Mining Co., held in Oakland, Calif.

Sept. 12. Fire in Mount Morgan Mines, Queensland, Australia, damaged shaft and caused suspension.

Sept. 15. Oil well regulation administered by State Geologist under state laws became effective in New Mexico.

Sept. 19. Rex Consolidated Mining Co., Wallace, Idaho, in bankruptcy, files petition for dissolution.

Sept. 19. Morton Mine, Hibbing, Minn., acquired by Inland Steel Co.

Sept. 28. Tenth Exposition of the Chemical Industries opened at Grand Central Palace, New York City, N. Y.

October

Oct. 1. Park-Utah Consolidated Mines Co. paid first dividend.

Oct. 10. California Regional Mining Conference at Stockton, Calif., defended "blue-sky" Laws.

Oct. 12. U. S. Supreme Court held Carson patent as valid.

Oct. 28. Scott Turner, of Michigan, appointed Director of U. S. Bureau of Mines.

November

Nov. 2. California Development Association held meeting at Sacramento, Calif., to discuss state and federal taxes as related to gold-mining industry.—Shattuck-Denn Mining Corporation, Bisbee, Ariz., organized through merger of Denn and Shattuck companies.—Shareholders of National Silver Mines, Vancouver, B. C., ratify sale of controlling interest to Selukwe Mining & Finance Co., of London.

Nov. 3. Canadian Institute of Mining and Metallurgy convened in annual session at Winnipeg, Manitoba.

Nov. 4. Ducktown Sulphur, Copper & Iron Co. sold to Ducktown Chemical & Iron Co.

Nov. 5. Anaconda Copper Mining Co., and W. A. Harriman & Co., of New York, acquired controlling interest of Giesche zinc and coal mines in Silesia.

Nov. 10. Stockholders of Nevada Consolidated and Ray Consolidated Copper companies meet to consider increasing capitalization to carry out merger plans.

Nov. 14. Final papers issued by Soviet authorities at Moscow, Russia, to Lena Goldfields, Ltd., for development of mining concessions.

Nov. 16. Sliding wage scale adopted by Coeur d'Alene mine operators effective.

Nov. 23. Supreme Court held depletion dividends subject to income tax in case of James Douglas estate—Metals Exploration Co. disposed of all assets to Harry Payne Whitney and associates of New York.

Nov. 30. Thirtieth Annual Convention of Northwest Mining Association, held at Spokane, Wash.

December

Dec. 1. United States Bureau of Mines began to function under reorganization plans recommended by Advisory Committee.

Dec. 4. Fire in mine of Fairview Mining Co., Nederland, Colo., entombed twenty-two men, two of whom died.

Dec. 9. Annual Convention of American Mining Congress held at Washington, D. C.

Dec. 10. Japan secured forty-five-year oil concession from Russia.

Dec. 19. N-T-U Company contracts sale of shale oil up to 10,000 bbl. per day from extraction plant in California.

Dec. 20. United Verde Copper Co.'s powder magazine, containing 1,200 cases of powder, exploded.

Dec. 29. Merger of North Butte and Tuolumne Copper companies voted.

Societies, Addresses, and Reports

"Vertical Integration" Urged for Copper Industry

Notman Tells New York Section, A.I.M.E., That Manufacturers Get Cream of Profits

Copper producers were urged to follow the example of the Anaconda company, in its acquisition of the American Brass Co., and take more interest in the manufacturing and marketing of finished products, in an address given by Arthur Notman at the January meeting of the New York section of the A.I.M.E. at the Machinery Club, 50 Church St., last Tuesday night. Most of the audience were disposed to agree with him.

Anaconda the Classic Example

The title of Mr. Notman's paper was "Manufacturing Profits on Copper." He developed the idea of "vertical integration" of the industry, or what is commonly known as the vertical trust, in which the same group controls all of the various steps between the production of the raw material and the marketing of the finished product. In the copper industry, the leading example of this is, of course, the Anaconda-American Brass combination. Mr. Notman discussed the reasons for the purchase of the Brass company, showed that experience had justified Anaconda's policy, and suggested that the plan be more widely adopted in the industry. Brief financial records of the leading wire and brass companies showed that their profits were, without exception, far above those of most copper producers. From 15 to 20 per cent on the outstanding capital issue seemed to be common. The copper producer can earn from 8 to 20 per cent on his capital investment, said Mr. Notman, if he pays not to exceed 10c. per lb. of annual capacity for a manufacturing plant.

A tabulation of the differential between the price of crude copper and the price of wire, sheets, and other copper and brass products, taken from *Mining Journal-Press* quotations over a term of years, gave an indication of what the manufacturing profits must be. For instance, beginning with 1912, the differential on sheets for each succeeding year was as follows: 5⅜c.; 7½; 7¼; 5⅜; 7⅜; 16; 8; 14; 10⅝; 8½; 7¼; 7⅝; 8¼; 8¼; and on Jan. 12, 1926, 8⅜c. The current differential on wire was 2¼c., though the manufacturing cost was said to be about 1c. The spread on copper bottoms was 18⅝c., Mr. Notman jocularly admitting that he did not know exactly what these were, but that their manufacture must be an attractive business.

The experiences of producers of some other metals were adduced in support of Mr. Notman's argument. Iron-ore producers, for example, have had hard sledding for some years, but the U. S. Steel Corporation has done very nicely. The National Lead Co. has had a most prosperous era in turning lead into various articles of utility to the ultimate consumer; the International Nickel Co. has been particularly fortunate in recovering from its post-war depression by manufacturing its nickel and Monel metal, and selling to perhaps 200 customers where it had one customer before.

Warns Against Possible Overexpansion of Manufacturing Plants

Manufacturing facilities must not be over-expanded, however, Mr. Notman emphasized, and he thought that if the producers controlled the whole situation, such over-expansion would not occur. He intimated that acquisition of present properties would be preferable to the building of new ones, provided the cost was reasonable, and also suggested that if the copper producers had been in close touch with the entire industry, they would not have continued producing copper so fast after the war and the copper stocks would not have assumed the proportions that they did. Finally, he thought there might be an opportunity to cut costs if the producers got hold of the manufacturing department, as they have had lots of experience in the last few years in doing that very thing, and had been very successful, whereas the manufacturers, being so well off, had perhaps not had sufficient inspiration.

E. P. Mathewson thought manufacturing the right branch of the industry to be in and seconded Mr. Notman's arguments. L. C. Graton spoke of the high cost of copper and brass products to the ultimate consumer, which might well be remedied by some such plan as Mr. Notman had proposed; of the stabilization of income that would inure to copper producers through wider activities; and suggested that present ills were due to restricted world consumption of copper rather than overproduction. E. L. Gruver regretted that there were no stocks of the manufacturing companies quoted on the New York Stock Exchange.

At the next meeting of the New York section, scheduled for March 16, G. H. Clevenger will discuss the selective flotation of lead-zinc ores.

Petroleum Geologists Elect Officers

The Rocky Mountain Association of Petroleum Geologists has elected the following officers: Charles M. Rath, president; Alex. W. McCoy, first vice-president; E. Russell Lloyd, second vice-president, and Roy Holloman, secretary.

At the last meeting of the association, oil shale was discussed. This subject occasioned the largest attendance of the year, and it is apparent, from the interest manifested by members, including the leading geologists and mining engineers of the Rocky Mountain region, that this phase of the industry is to come into its own at a not distant future, as an important factor in replenishing the steadily decreasing oil reserves of the United States. The opinion was general that oil-shale mining is soon to become important.

Sterling Fellowships for Research at Yale University

Fellowships have been established by a gift of $1,000,000 from the trustees of the estate of the late John W. Sterling to stimulate scholarship and advanced research in all fields of knowledge. They are open equally to graduates of Yale University and other approved colleges and universities in the United States and foreign countries, to both men and women, whether graduate students, or instructors or professors when on leave of absence, who desire to carry on studies and investigations under the direction of the graduate faculty of Yale University or in affiliation with that body.

Applications for these fellowships should be addressed to the Dean of the Graduate School of Yale University, New Haven, Conn., on blanks which may be obtained from him. Applications for the junior fellowships must be submitted by March 1, and applications for the senior fellowships by April 1, 1926.

A. C. Lawson Heads Geological Society of America

The Geological Society of America held its thirty-eighth annual meeting at Yale University, New Haven, Dec. 28-30. The president for the coming year is Prof. A. C. Lawson. The Society of Economic Geologists held a business meeting, only, at the same time. H. Foster Bain was elected president.

There were held also at the same place and under the same general auspices meetings of the Mineralogical Society of America and the Paleontological Society. The annual dinner was held on Tuesday evening, Dec. 29. Prof. William B. Scott, of Princeton, retiring president, acted as toastmaster. On Monday evening a complimentary smoker was tendered to members of the Geological Society and affiliated societies, which proved to be a popular feature of the program.

A varied list of geological papers was presented and discussed, there being some especially significant papers on earth structure and mountain origin in the western part of the United States.

Oil Exposition in London Scheduled for April-May

The trustees of the Crystal Palace in London have announced the organization of an International Oil Exposition to be held there from April 21 to May 8, 1926. The management plans that the exposition shall be representative of every branch of the world's petroleum industry grouped under the following main sections: Production, refining, transport, distribution. In addition, provisions are to be made for several special sections embracing government exhibits, laboratory exhibits, shale exhibits, fire-fighting apparatus, and models section, which will be arranged adjacent to and forming part of the main exposition.

Men You Should Know About

Morton Webber recently arrived in New York, and has left for Mexico.

M. Edward, of Johannesburg, South Africa, is in New York for a few weeks.

Frank L. Stack has returned to New York from Bolivia and will leave for Chile shortly.

C. R. Kuzell, metallurgist of the United Verde at Clarkdale, Ariz., has been in New York for the last week.

Colonel A. E. Humphreys, of Denver, Colo., president of the Humphreys Corporation, was in Houston, Tex., recently.

S. G. Blaylock, general manager of the Consolidated Mining & Smelting Co., of Trail, B. C., was a recent visitor in New York.

M. F. Quinn has been placed in charge of the property recently acquired by the A. S. & R. Co. at Taviche, Oaxaca, Mexico.

H. A. Kursell, of Wallace, Idaho, a geologist connected with the Federal Mining & Smelting Co., is visiting his family in New York.

John G. Kirchen, general manager for the Tonopah Extension Mining Co., has returned to Tonopah from New York and San Francisco.

A. J. Bone has accepted a situation with the General Development Co. at Campo Morado, Guerrero, Mexico, where a pyritic smelter is in course of construction.

K. C. Laylander, general manager of the Kitchner placer mine, at Cariboo, B. C., has left the mine for New York, where he will confer with his principals about the future development of the property.

R. E. Allen, who about a year ago went from Los Angeles, Calif., to take charge of the Lander Oil Co.'s boring at Orallo, Queensland, Australia, left that country lately on his return to the United States.

A. W. Newberry, mining engineer, of New York, returned to New York on New Year's day from South Africa, where he has spent seven months on mining business. Mrs. Newberry accompanied him.

Andrew W. Liddell, formerly with the Arizona Copper Co., and more recently connected with the Phelps Dodge Mercantile Co., in Bisbee, Ariz., has been made assistant general manager of the mercantile company.

Fred Marston, metallurgist in charge of construction and operation, has recently completed and put into satisfactory operation the new 150-ton zinc-lead selective flotation mill of the American Mines Co. at Hachita, N. M.

T. C. Wilson has left Butte, Mont., to accept a position as manager for the Colorado Zinc-Lead Co., at Leadville, Colo. For a number of years he had been connected with the Timber Butte Milling Co., and lately as general mill foreman and metallurgist.

J. B. Tenney, formerly geologist with the Copper Queen Branch of the Phelps Dodge Corporation, has been named investigator for the Arizona Bureau of Mines, to collect data concerning the mining industries of the state and historical matter for the state bureau.

A. H. Fay, Assistant Editor of *Mining Journal-Press,* is spending a week in the Kentucky-Illinois fluorspar district, the main source of fluorspar in this country. He anticipates obtaining for *Mining Journal-Press* readers first-hand information regarding mining and milling methods, future supplies, and other related data.

General J. C. Greenway

C. W. Newton, of Wallace, Idaho, manager of the Callahan Zinc-Lead Co., left on Jan. 14 for New York to attend the meeting of the directors of the company on Jan. 19. **Donald Callahan,** of Wallace, vice-president of the company, who has been in Chicago since the holidays, will also attend the meeting.

Dr. R. B. Moore, formerly chief chemist of the U. S. Bureau of Mines, and now general manager of the Dorr Company, who was largely responsible for the development of helium production during the war, was presented with the Perkin Medal for 1925 at the Chemists' Club on Jan. 15. The medal is given by the American Society for Chemical Industry, and the selection is made by a committee from that organization, the American Chemical Society, the American Institute of Chemical Engineers, and the American section of the Société de Chimie Industrielle.

Obituary

Thomas P. Kerns, a New York mining man, died recently in San Francisco.

William Grant, for many years prominent in mining circles in Nevada and northern California, and formerly connected with the Gold Wedge Mining Co., died recently at his home in Sacramento at the age of sixty-eight. He is survived by a widow and a son.

Stanford Leland, who had been for the last seven years employed as a mining engineer with the U. S. Refining & Smelting Co. in Mexico, died recently at Napa, Calif. He was forty-one years old, and was the son of Frank M. Leland, at one time active in the copper mining industry of Idaho.

Edward A. Lippert, long identified with the mining industry of Africa, died in Hamburg on Dec. 8, 1925. He was the concessionaire who obtained from Paul Kruger the iniquitous dynamite monopoly. Lippert's plantation was started by him. He also obtained a concession from Lobengula, in Mashonaland; but this was secured at a later date by Cecil Rhodes. Mr. Lippert was a cousin of the late Alfred Beit.

John Cleveland Osgood, founder of the Colorado Fuel & Iron Co., a man that had done much to keep alive mining in Colorado, died at Redstone, Colo., Jan. 4, at the age of seventy-five. Mr. Osgood after resigning from Colorado Fuel & Iron, organized the Victor-American Fuel Co., and was the practical head up to 1920, then he handed the reins over to **Benjamin W. Snodgrass,** the former general superintendent. Mr. Osgood was a native of Brooklyn, N. Y.

General John Campbell Greenway, mining engineer, a soldier both in the Spanish-American War and in the Great War, in which he won the Distinguished Service Cross, the Croix de Guerre with two Palms, the Legion of Honor, and the Croix de l'Etoile Noire, died in New York City in Roosevelt Hospital on Jan. 19, 1926. General Greenway was fifty-three years old. He was borne in Huntsville, Ala., and after attending the University of Virgina, went to Yale, where he was graduated in 1895 as president of his class. On leaving college Greenway took a job at the furnaces of the Carnegie Steel Co., Duquesne, Pa. At the outbreak of the Spanish-American War he joined Roosevelt's Rough Riders as a private, but was soon commissioned a second lieutenant, then first lieutenant for gallantry in action at the Battle of San Juan Hill, after which Colonel Roosevelt recommended him to Congress for brevet of captain. At the end of the Spanish-American War Greenway became assistant superintendent of the United States Steel Corporation at Ishpeming, Mich., later becoming general superintendent of the Oliver Mining Co. In 1910 he went to Arizona and became general manager of the Calumet & Arizona Mining Co., the New Cornelia Copper Co., and the Cornelia & Gila Bend Railway. In 1917 Greenway joined the American Expeditionary Forces to France, and as a Lieutenant Colonel of the 101st Infantry of the 26th Division distinguished himself in the battles at Cantigny, Chateau Thierry, and St. Mihiel. After the armistice he returned to the Calumet & Arizona Mining Co. He was a member of the Board of Regents of the University of Arizona, chairman of the Defense Committee of the Council of Defense of Arizona, a member of the American Institute of Mining and Metallurgical Engineers, of the Yale Engineering Society, and president of the Yale Club of Arizona. Funeral services for General Greenway were held on Jan. 20 at St. Bartholomew's church in New York.

New Machinery and Inventions

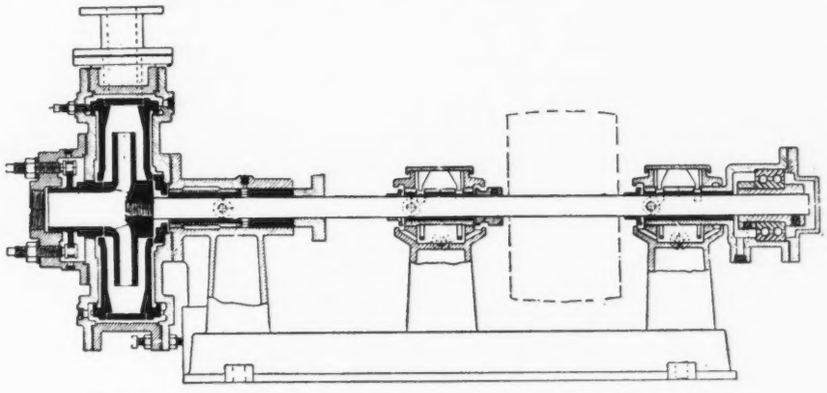
Take-up Liners a Feature of New Sand Pump

The efficient operation of the solid-runner sand pump depends on the maintenance of minimum clearance between the rotating member and the side liners, necessitating the frequent renewal of wearing parts. The only available alternative method of counteracting decreasing output as wear occurs is to raise the speed, which is often impracticable.

To minimize trouble arising from liner wear and to raise general operating efficiency, the Krogh Pump & Machine Works, San Francisco, Calif., has developed a new and improved type of lined sand pump, with hollow runner, arranged with ample clearance between impeller and side liners, which can be adjusted several times before the parts are so worn that they must be removed and replaced. The distinguishing feature of the new pump, however, is the provision of a special and novel type of suction-pipe liner, which is engaged by threaded screws, passing through the pump cover and held by lock nuts. When wear has occurred at the impeller hub, the screws are turned from the outside, without even stopping the pump, and minimum clearance again insured. The pump can thereby be operated at maximum efficiency and maximum output at all times, irrespective of the wear on the impeller hub and without raising the speed of the runner. The invention insures the maintenance of what is virtually a direct and unimpeded flow from the stationary suction pipe to the interior of the revolving runner, thereby obviating the churning effect and wasted power that is observable with open-suction runners.

All wearing parts are of exceptionally hard metal. The impeller is threaded on the shaft, and can be removed and replaced without disturbance of the shaft in its bearings. The bearings are of the ring-oil type, the thrust being taken on a double-row ball bearing.

The new Krogh sand pump indicates a significant advance in the design of equipment of this type, insuring consistent output, even power consumption and economical operation.



Cross section of new sand pump equipped with take-up liners

An Electric Melting Pot for the Shop

For melting babbitt, solder, lead, tin, and other metals used about a shop, a line of tilting electric melting pots has recently been introduced by Harold E. Trent, 259 North Lawrence St., Philadelphia. These pots are made in four standard sizes, the largest having a capacity of 1,500-lb. and the smallest 10-lb. They are electrically heated and controlled by hand or by thermostat. Means are provided for maintaining automatically the working temperature for various soft metals and alloys.

The crucible and flange are cast in one piece of high-grade iron to resist the antimony in babbitt and type metals. The casting has been so designed to counteract stresses in the iron when heated. Sheet steel with an aluminum paint finish has been used for the casing.

Baghouse Construction Aided by Tile Development

In erecting the baghouse which is now being built for the St. Louis Smelting & Refining Co. the Wiederholdt system of reinforced tile concrete construction has been used throughout. The engineers and contractors state that this is the first building of any size with straight walls which has been erected in this manner. This type of construction has been made possible by a new development in the manufacture and use of tile.

The building will be practically a reinforced concrete structure, in which the concrete is protected both inside and outside by hard-burned clay. Baghouses many times have temperatures running up to several hundred degrees. Temperatures of this sort have caused disintegration of many brick baghouses. The tile is said to be unaffected by the fumes and provides a permanent form and covering for the concrete.

Construction is by the Wiederholdt Construction Co., of St. Louis, Mo., long known as builders of chimneys at home and abroad. The Wiederholdt system of construction for chimneys is practically the same as the system of construction for building baghouses, except that in the latter straight walls are built instead of curved walls.

Staehle With Keystone

E. M. Staehle, formerly in charge of industrial advertising for the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has resigned to become eastern representative of the Keystone Mining Catalogs. Mr. Staehle, who succeeds Edward B. Day, will have his headquarters at the offices of the McGraw-Hill Co., New York, which recently acquired the Keystone catalogs and directories.

Loose Pulleys Now Made With Tapered Roller Bearings

A new loose pulley that incorporates the advantages claimed for the tapered roller bearing, as well as certain other features that are expected to interest users of loose pulleys, has recently been introduced. It is the result of the effort of the Dodge Manufacturing Corporation, of Mishawaka, Ind., to make further application of Timken roller bearings to its lines. The new roller-bearing loose pulleys are available in both iron and steel.

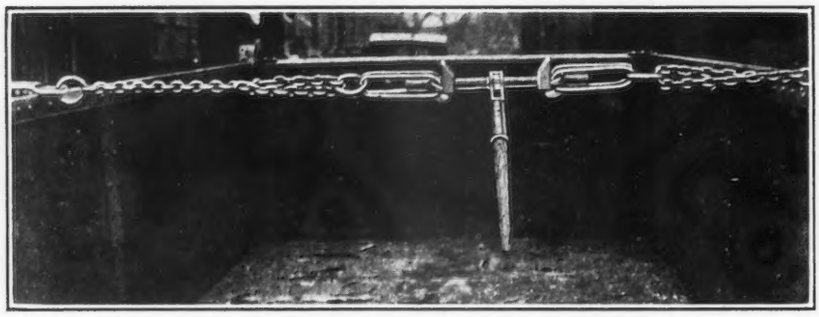
The roller-bearing steel loose pulley consists of an Oneida steel pulley provided with an extra large bore to accommodate a roller-bearing unit mounting. The pulley is not split, but is riveted at the rim, the clamp hub holding the unit mounting in place.

Cast-iron loose pulleys are provided, made from the company's regular double-belt solid iron pulley patterns. For diameters up to and including 20 in. the pulleys are counterbored to receive the unit mounting, which is the same as that used in the steel pulley except that the housing is not used. In this case the hub of the pulley serves as the housing.

Provision for adequate lubrication, a feature always of importance in loose pulley operation, has been given special attention in the design of this loose pulley, and, in addition, a positive dust-proof feature has been provided, the company states. In the case of both steel and iron pulleys, a lubricating feed pipe is located between the arms, to be conveniently accessible, and is inserted through a hole bored in the pulley hub.

The Dodge-Timken unit mounting consists of two tapered roller bearings mounted on a ground-steel tube and fitted to an accurately machined cast-iron housing. Grease seals and two clamping collars are mounted on the threaded ends of the steel tube. The tube is slotted and threaded at each end and is held to the shaft by the two collars, which are used to obtain accurate adjustment of the bearings on the steel tube. In diameters over 20 in. the pulleys are bored straight to receive the unit mounting, which is secured by setscrews. The special grease seals positively prevent the dust working in or the lubricant working out.

A feature that the manufacturer considers of importance is the availability of both iron and steel loose pulleys from stock. The pulleys are made with standardized bores and the unit mountings with standardized outside diameters and to accommodate certain shaft sizes. It is therefore possible in certain cases to change the bore of the



This jack is being used for pulling in the bent sides of cars

pulley by merely applying another unit with a housing having an outside diameter conforming to the pulley bore and with a tube to accommodate the desired shaft diameter.

A special bulletin covering the device in detail may be obtained on request from the company.

Device Protects Conduit Threads

Maintenance men often encounter choked and damaged threads on conduits and pipes which must be made to fit the unions and fittings with which they are to be used. To avoid this, it has been customary for the tube manufacturer to supply a union on each length shipped, but since it is impractical to protect both ends in this manner, on account of the expense, the difficulty is not entirely removed.

The Wedge Thread Protector Co., of Cleveland, Ohio, has solved the problem by means of a newly patented "Wedge Thread Protector." This consists of a metal cap which is slightly tapered and which has a shoulder to protect the first thread and a depression running all around the inner end, which is so formed that it cannot be shaken loose. A paper cushion, which comes separately, is placed over the conduit end, and over this the metal cap is driven, either by a blow of the open hand or with a mallet. The protector, as described, is placed on the ends of the conduit by the manufacturer as soon as the threads are cut, thus protecting them in the course of the subsequent enameling process and during shipment. The protector cannot be jarred off during transit, but it may be removed by a half turn with a Stillson wrench.

A Device for Straightening Out Sides of Cars

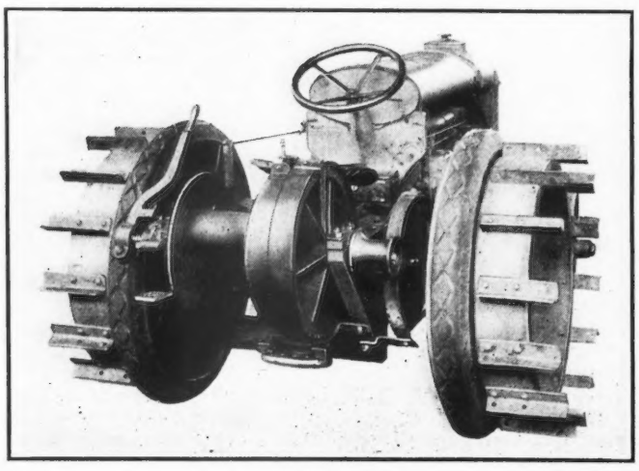
Any mining company which maintains a number of open steel cars for the hauling of ore and materials is confronted with the problem of keeping the cars from caving in at the sides under heavy service. The jack here described is used for straightening center sills and sides of cars by pushing apart or pulling together at the bending point. With chains and hooks it can be used for pulling in sides of cars which have been bent outward. The jack is extremely simple, consisting of a steel screw, ratchet with pawl, and two steel nuts, the latter being designed with flat projection on one side for pushing and a hook on the other side for pulling. It is made by the Duff Manufacturing Co., of Pittsburgh, Pa.

Hoist Attachment for Tractors

In the accompanying illustration is shown a tractor hoist attachment which consists of a friction drum supported in a cast-steel frame fastened to the tractor by eight of the bolts which connect the rear axle housing and the transmission housing, and two bolts through the two outside holes in the drawbar cap. The drawbar can be used for hauling without removing any part of the hoist. No machine work is required for assembling the frame on the Fordson tractor.

Power is supplied through a roller chain drive and sprockets from the pulley shaft of the tractor. A rod placed on the lever side of the drum gives the operator full control of the throttle from his regular position. The hoist is made by the Clyde Iron Works Sales Co., Duluth, Minn.

A rod placed on the side of the hoisting drum gives the operator of the tractor full control of the throttle from his regular position



Letters From The Manufacturer

Shovel Not Unsatisfactory

Gentlemen:

The writer's attention has been drawn to the article in the Dec. 19 issue of *Mining Journal-Press* entitled "Mines and Minerals of Inyo County, California." On page 971 in the first column in the paragraph describing the operation of the Pierson Mine Co., is the following sentence: "A Hoar shovel was used at one time, but its use has been discontinued." The natural inference which the reader would draw from this statement is that the Hoar shovel proved unsatisfactory in this work, and for that reason was discarded. Such, however, is far from being the case.

In the latter part of 1924 the Pierson Mine Co. entered into a contract with the Bullion Tunnel Co. to drive this development tunnel to the point where the mining company expected to find a contact vein. The Bullion Tunnel Co. purchased from us a Hoar shovel to use in this work, and all of the mucking of its contract, something over 2,000 ft., was done to the company's entire satisfaction with the Hoar shovel. On the completion of its contract the Bullion Tunnel Co. removed its equipment, which, of course, included the shovel.

While, of course, the statement made in the article is not actually a misstatement, we hold that it is misleading, and we feel that where equipment is mentioned by name, whether of our manufacture or other companies' manufacture, sufficient details should be given to enable the reader to form an exact opinion of whether the equipment was satisfactory or not. We feel that we are entitled to a clear statement of the facts where our equipment is mentioned. HOAR SHOVEL CO.

A. E. Southmayd, Secretary.

Trade Catalogs

General Electric. Catalog 6001B, superseding all previous catalogs issued by the General Electric Co., with the exception of those dealing with railway, mine, and industrial supplies and merchandise products, is being distributed. The complete catalog is issued every two years. The book is 2 in. thick, and contains more than 1,100 8 x 10½-in. pages. The illustrations total more than 3,200. The catalog is thumb-indexed into sixteen sections as follows: Generation, wire and cable, distribution transformers, arresters, voltage regulators, switchboards and accessories, meters and instruments, motors, motor applications, industrial control, railway, lighting, industrial heating, miscellaneous, and indexes. In the indexes, products are classified both according to subjects and to catalog numbers.

Deep Well Pumps — Worthington Pump & Machinery Corporation, 115 Broadway, New York, has issued Bulletin D-312, superseding Bulletin No. D-311, which covers its lines of "Axiflow" and "Coniflow" pumps for work in deep wells.

The Market Report

Prices of All Metals Weaken

Demand Generally Good—Concessions in Quotations Attract Business

New York, Jan. 20, 1926—Prices of practically all metals declined somewhat in the week ending today—copper about one-eighth cent; zinc about one-quarter; tin about one and a quarter, silver one cent, and antimony about two cents, while lead is quotably about the same, though there is less disposition to quote premium prices for early delivery. No particular reason can be assigned for the weakness, as no change in consumption is evident, but prices have probably been influenced by the easier trend in the London metal market and in the New York stock market.

Copper Sales Improve

The volume of copper sales has been better than for more than a month, Monday and Tuesday being particularly active days. These large sales were brought about by the fact that a considerable number of buying orders had been waiting for booking at 14c., delivered, and when some of the large producers came down to this price on the days mentioned, their offerings were quickly taken up. A good business was also done in the Middle West at 14⅛c. In the East, so far as reported, no seller was disposed to quote below 14c. on any considerable tonnage, though 13.975c. was done on one or two attractive orders. After selling a satisfactory volume yesterday some producers revised their prices upward to 14⅛c., but were unable to sell at that level to any extent, and copper was available early today at 14c., though not so freely as yesterday. Most of the orders have been for February-March, and it would appear that consumers are not as well provided for their future requirements as normally.

According to a compilation made in one well-informed source, the United States consumption of copper in 1925 amounted to 1,662,342,000 lb., a record for all time, though closely approached by the 1918 consumption of 1,661,670,000 lb.

World's production is estimated by the American Bureau of Metal Statistics as 1,588,100 short tons, in 1925.

Daily Prices of Metals

Jan.	Copper N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N.Y.	St. L.	St. L.
14	13.80@13.875	61.75	62.625	9.275	9.10	8.30@8.60
15	13.85	61.875	62.75	9.25	9.10	8.30@8.525
16	13.85	61.875	62.75	9.25	9.10	8.25@8.40
18	13.775	61.25	62.00	9.25	9.10	8.20@8.375
19	13.775	61.00	61.75	9.25	9.10	8.20@8.30
20	13.85	61.00	61.75	9.25	9.10	8.20@8.40
Av.	13.823	61.458	62.271	9.254	9.10	8.338

*The prices correspond to the following quotations for copper delivered: Jan. 14th, 14.05@14.125c.; 15th and 16th, 14.10c.; 18th and 19th, 14.025c.; 20th, 14.10c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of *Mining Journal-Press* and a special representative of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce.

London

Jan.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
14	59⅜	60½	65¾	283¾	276½	35 3/16	34⅞	38 11/16	37 13/16
15	59⅜	60⅜	65½	283½	276¼	35 1/16	34 13/16	38½	37⅝
18	58¾	59⅞	65	281	274½	34½	34⅜	37¾	37
19	58¾	59⅞	65	279¼	273½	34 7/16	34⅜	37⅝	37
20	58¾	59⅞	65	279	274¼	34 9/16	34½	37 13/16	37 5/16

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Jan.	Sterling Exchange "Checks"	Silver		Gold London	Jan.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
14	4.85¼	68⅛	31½	84s11d	18	4.85⅝	67½	31 1/16	84s11½d
15	4.85⅛	67⅞	31 5/16	84s11d	19	4.85⅛	67⅜	31 5/16	84s10½d
16	4.85⅝	67½	31 3/16	..	20	4.85⅞	67⅜	31 1/16	84s10½d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command three-eighths cent premium.

Lead Continues Active

The lead market continues to be active, with current production just about keeping pace with demand. The tendency to ask premium prices is perceptibly less, however, and there would be no difficulty in getting lead for reasonably early delivery today at 9.10c. St. Louis, and 9.25c., New York. Very little January lead is available, it is true, but February lead is freely offered. April lead has also been sold in the New York market at the price mentioned, but most buyers are not interester beyond February. Desilverized has sold at a premium of about 5 points in the St. Louis market; corroding grades bring the usual premium of 10 to 15 points, depending upon the brand. Foreign demand for lead has improved somewhat in the last two or three days, though the London price has not been affected much. The American Smelting & Refining Co. continues its contract price of 9.25c., New York.

Prompt Zinc Declines

Galvanizers have complained of poor business, but nevertheless they have bought substantial tonnages of zinc in the last week, possibly attracted by the lower prices. Shipments have not been quite so good recently, and zinc for early delivery has been more freely available, so that the premium on spot metal has largely evaporated. The decline in price, therefore, has been less evident for forward deliveries, which are now quoted at around 8.20c., compared with 8.30@8.35c. a week or two ago. Brass Special has relapsed to about a 10-point premium over Prime

Western, and High-grade seems to be quoted by all producers at 10¼c. delivered in the East.

Tin at 61¾c.

Tin has been pronouncedly weaker, though tin-plate sales are reported as unusually good. Probably the declines in the other metals have had a sentimental effect. Buying was very satisfactory on Monday and Tuesday, at the lower prices, which have usually tempted consumers in recent weeks. April tin has sold at from one-half to three-quarters of a cent less than prompt.

Silver Prices Decline

Continued selling by China has forced silver prices down, and the quotations on Jan. 20 represent the lowest rates, both abroad and in New York, for the year. India has shown a little more interest on the decline, but orders from this quarter are small and have not sufficient influence to counteract the position taken by China.

Mexican Dollars — Jan. 14th, 52¼c.; 15th, 52c.; 16 and 18th, 51¾c.; 19th, 52c.; 20th, 51⅝c.

Sterling Exchange Strong

Strength in sterling exchange featured the foreign money market, and the current movement is expected to carry it back to the parity which has not been reached since 1914. Closing cable quotations on Tuesday, Jan. 19, were as follows: francs, 3.7375c.; lire, 4.04c.; and marks, 23.81c. Canadian dollars, ¼ per cent discount.

Other Metals

Quotations cover large wholesale lots unless otherwise specified

Aluminum—99 per cent grade, 28c. per lb.; 98 per cent, 27c. London, 98 per cent, £118 per long ton.

Antimony — Per pound, f.o.b. New York: Chinese brands, spot, 24½@22½c. February arrival, 24@22c. Cookson's "C" grade, spot, 24c. Market sluggish and weak.

Bismuth—$3.30@$3.35 per lb., in ton lots. London, 12s. 6d.

Cadmium—60c. per lb. London, 1s. 9d. for Australian metal.

Iridium—$350 per oz. for 98@99 per cent. Nominal. London £80@£85 for 99.5 per cent.

Nickel—Ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent); London, £170@£175 per long ton.

Platinum—$120 per oz. refined officially quoted. Sales also at $115@$118. Crude, $114@$114.50. London, £23 10s. @£25 for refined; crude, £21@£22½.

Quicksilver—Per 75-lb. flask: $87½@$88½ for spot and forward. San Francisco, $90. London, £15@£15½.

The prices of **Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Monel Metal, Osmium, Palladium, Radium, Rhodium, Ruthenium, Selenium, Tellurium, Thallium, Tungsten,** and **Zirconium** are unchanged from the issue of Jan. 9.

Metallic Ores

Manganese Ore—Per long ton unit of Mn, c.i.f. North Atlantic ports: Caucasian, Brazilian, Cuban, and Chilean, 40@43c.; nominal. London, 1s. 9d. for Indian, Brazilian, and washed Caucasian.

Tungsten Ore—Per unit of WO_3, N.Y.: Wolframite, $11.50@$12.50; Western scheelite, $12.50@$13.50. Domestic demand very light, and prices largely nominal. European demand good.

Chrome Ore, Galena and **Pyrite Radio Crystals, Iron Ore, Molybdenum, Tantalum,** and **Vanadium Ores** are unchanged from quotations in the Jan. 9 issue.

Lead Ore Higher—Zinc Blende Unchanged

Joplin, Mo., Jan. 16, 1926

Zinc Blende	Per Ton
High	$60.90
Premium blende, basis 60 per cent zinc	$57.00@$58.00
Prime Western, basis 60 per cent zinc	$56.00
Fines and slimes, basis 60 per cent zinc	$54.00@$52.00
Average settling price, all ores	$54.18
Galena	
High	$123.00
Basis 80 per cent lead	$120.00
Average settling price, all ores	$119.78

Shipments for the week: Blende, 13,665; lead, 1,833 tons. Value, all ores the week, 982,220.

Production of zinc concentrate for the week was variously estimated by buyers at 16,500 to 17,000 tons, and the sales today for next week's delivery total 21,000 tons. Sellers freely accepted offerings they declined three weeks ago, realizing the metal market was none too stable this month.

One buyer of lead advanced the price to $120 at the beginning of the week, but found few sellers at that price. Others were offering $120 today, with few sellers accepting this advance. Firm to higher lead is anticipated by sellers of concentrate.

Platteville, Wis., Jan. 16, 1926

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$58.50
Lead Ore	
Lead, basis 80 per cent lead	$120.00

Shipments for the week: Blende, 770 tons; lead, 60 tons. Shipments for the year: Blende, 1,680; lead, 60 tons. Shipments for the week to separating plants, 1,431 tons blende.

Non-Metallic Minerals

Fluorspar—German fluorspar is being offered on the eastern seaboard at $17.50, duty paid, for 85-5 material. This is the price asked by domestic producers for the same grade, f.o.b. mines, in Illinois and Kentucky.

Amblygonite, Andalusite, Asbestos, Barytes, Bauxite, Borax, Celestite, Chalk, China Clay, Diatomaceous Earth, Emery, Feldspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Ilmenite, Iron Oxide, Lepidolite, Limestone, Magnesite, Manjak, Mica, Monazite, Ocher, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystals, Rutile, Silica, Spodumene, Sulphur, Talc, Tripoli, and **Zircon** are unchanged from prices in the Jan. 9 issue.

Mineral Products

Arsenious Oxide (White arsenic)—3c. per lb. London, £14@£15 per long ton.

Sodium Nitrate—Spot, crude, $2.67 per 100 lb., ex vessel, Atlantic ports.

Copper Sulphate, Sodium Sulphate, and **Zinc Oxide** are unchanged from prices in the Jan. 9 issue.

Ferro-Alloys

Ferrocerium, Ferrochrome, Ferromanganese, Ferrophosphorus, Ferrosilicon, Ferrotitanium, Ferrotungsten, Ferro-uranium and **Ferrovanadium** are unchanged from prices in the Jan. 9 issue.

Metal Products

Rolled Copper—Sheets, 22½c.; wire, base price, 16c. per lb.

Lead Sheets—Full, 13c. per lb.; cut, 13½c.

Nickel Silver—29¾c. per lb. for 18 per cent nickel Grade A sheets.

Yellow (Muntz) Metal — Dimension sheets, 20½c. per lb.; rods, 17½c.

Zinc Sheets—12c. per lb., f.o.b. works.

Refractories

Chrome Brick, Firebrick, Magnesite Brick, Silica Brick, and **Zirkite** are unchanged from prices in the Jan. 9 issue.

Iron Trade Firm—Pig Iron Quiet —Coke Up

Pittsburgh, Jan. 19, 1926

Though there has been an increase in steel buying, it does not appear that the market has broadened out, by this date, as much as was expected. In some selling quarters a little note of disappointment is heard, and in others it is argued that inventory taking and other year-end matters are too recent for the market to show its full swing as yet.

Mill operations seem to be fully maintained, but there is the help of an accumulation in various lines in the last two months of the old year.

No unfavorable developments have occurred in any consuming lines. The decrease in oil production improves drilling prospects for the season, but it is too early for demand to be expressed in any large way.

Fabricated structural steel lettings hold up very well, and occasionally there is fair-sized buying of freight cars.

Finished-steel prices are steady, but are no stronger than a month ago.

Pig Iron—The market remains quiet, with most of the quarter's business done and consumers indisposed to look farther ahead. Bessemer, $21; basic, $20; foundry, $20.50, f.o.b. Valley furnaces.

Connellsville Coke—Blast furnaces are practically out of the market. Eastern demand has continued heavy, and prices have jumped in the week, about $3 a ton; spot furnace, $8.50@$9.50; yard crushed, $10.50@$11; foundry, nominal, $9.50@$10.50, per net ton at ovens.

Company Reports

"Santa Gertrudis Business in Healthy Condition," Says Baker

At the general meeting of the Santa Gertrudis Co., Ltd., at which the capital was increased to £1,800,000 by the creation of 300,000 additional shares of £1 each, the chairman, F. W. Baker, outlined conditions at the principal mines in which the company is interested, concluding with the statement that, "Altogether, the business in which the Santa Gertrudis Co., Ltd., holds interests is in a very healthy condition. These include the properties at Pachuca, at Fresnillo, and at Teziutlan, all in Mexico. The following are extracts from the chairman's remarks:

"Mr. Rose has advised us that as from Jan. 1 he can remit us £30,000 a month from the Santa Gertrudis group of mines. He is earning at the present time £35,000. He states that on a conservative basis we could count on receiving monthly remittances at the rate of £30,000. With the old note issue retired, and our indebtedness to the government wiped out, there is no reason why we should not be in a position to apply a very large percentage of the annual profit of £360,000, plus what we shall get from the Mexican Corporation, in dividend distribution, for we shall not have to create large reserves at this end, as these provisions are being made by the Mexican operating companies, who have at the present time upward of £60,000 in hand.

"Now, touching the question of dividends. In our circular to you we have indicated that interim dividends may be counted on from the beginning of the year at the rate of 10 per cent per annum, with the probability of some further distribution at the end of the year. I do not think on the figures I have given you that your board has overstated the case, and I think we may reasonably count on some increased final distribution.

"I now turn to the position of the Fresnillo property in which the Mexican Corporation is interested. Mr. Rose in his report as at June 30 of this year gives the ore reserves of oxide and cyaniding ores at over 7,000,000 tons, having a gold content of 60,000 oz. and 40,400,000 oz. of silver. The reserves in the sulphide orebodies only recently opened up are given at 104,000 tons, to yield a profit of from $7 to $10 per ton. He estimates the profits as from the date when the mill to treat the sulphide ores is in operation at full capacity at over £300,000 per annum.

"At the Teziutlan unit, during the financial year ended with June, work was begun on remodelling the mill to treat about 150 tons a day of better-grade copper-zinc ore. Test work on a working scale in the pilot plant was successful in proving the ability to produce good shipping grades of copper and zinc concentrates by selective flotation. The 150-ton mill is now in operation, and concentrates are being shipped to the smelters. The property is now self-supporting, and will yield a moderate profit. In a letter received on October 10 from Mr. Rose he says: 'Altogether, the business in which the Santa Gertrudis Co., Ltd., holds interests is in a very healthy condition.'"

McIntyre Porcupine Earnings Increase

Quarterly earnings of the McIntyre Porcupine Mines, Ltd., for the period ended Dec. 31, 1925, were $417,595, a material increase over those of the preceding quarter. The company mines gold in the Porcupine district in Ontario. The financial statement follows:

	Quarter Ended Sept. 30, 1925	Quarter Ended Dec. 31, 1925	Six Months, Fiscal Year to Date
Gross recovery	$886,117.82	$946,688.79	$1,832,806.61
Costs, including development	518,793.82	539,178.16	1,057,971.98
Operating earnings	$367,324.00	$407,510.63	$774,834.63
Non-operating revenue	24,040.99	24,972.05	49,013.04
	$391,364.99	$432,482.68	$823,847.67
Less provision for taxes for period	18,754.40	14,887.30	33,641.70
Net earnings before plant depreciation	$372,610.59	$417,595.38	$790,205.97

Copper Production Highest on Record

The American Bureau of Metal Statistics gives, in short tons, copper production by the principal countries of the world which furnished about 97 per cent of the world's total in 1923 and 1924. In the main, production of blister copper is shown without any attempt to segregate according to countries of origin.

	Sept., 1925	Oct., 1925	Nov., 1925	Dec., 1925	Jan.-Dec., 1924	Jan.-Dec., 1925
United States	76,571	83,239	79,292	79,030	898,464	948,127
Mexico	3,273	3,667	3,498	3,723	36,955	36,249
Canada	2,459	3,100	2,708	3,373	25,733	27,703
Chile and Peru	20,358	23,182	22,459	22,162	227,910	236,984
Japan	5,706	6,160	6,427	(b) 6,000	69,355	72,096
Australia	1,058	620	865	1,591	15,762	12,822
Europe (a)	7,400	10,100	9,700	8,800	88,000	106,200
Belgian Congo	8,153	8,566	8,224	6,597	94,478	98,748
Rhodesia	228	.....	.....	.....	2,827	1,979
Totals	125,206	138,634	133,173	131,276	1,459,484	1,540,908
Estimate for non-reporting countries	3,900	4,000	3,900	4,000	60,800	47,200
World's total	129,100	142,600	137,100	135,300	1,520,300	1,588,100

(a) Incomplete; partly estimated; (b) Estimated.

Vein Copper Mines Make Big Increase in Production

The American Bureau of Metal Statistics shows the following data in short tons for mine and smelter copper production in the United States:

	Oct., 1925	Nov., 1925	Dec., 1925	Jan.-Dec., 1924	Jan.-Dec., 1925
Porphyry mines	26,573	26,434	26,127	315,475	320,151
Lake mines	7,204	6,097	6,448	68,828	78,013
Vein mines	32,798	31,262	32,792	369,369	399,951
Custom ores	4,244	3,607	3,811	39,668	43,391
Total crude production	70,819	67,400	69,178	793,340	841,506
Imports in ore and matte	5,969	6,597	(a)	76,139	( )
Blister produced from scrap	1,976	1,651	1,410	4,621	12,567
Total supply	78,764	75,648	.....	874,100	.....
Smelter production	83,239	79,292	79,030	898,464	948,127

(a) Not yet available.

Silversmith Mines Earned $103,788 During Fiscal Quarter

The Silversmith Mines, Ltd., mining silver, lead, and zinc in British Columbia, netted $103,788 from the treatment of 9,596 tons during September, October, and November, 1925, according to the report just issued. It shows:

Gross income		$231,641.17
Freight and treatment charges	$29,932.17	
Operating expense	80,019.33	
Taxes accrued	12,230.10	
Depreciation	5,670.65	
		127,852.25
Net profit		$103,788.92
Tons mined		9,596
Ounces of silver paid for by smelter		167,530
Average silver price		$0.70
Pounds of lead paid for by smelter		1,182,825
Average lead price		$7.00
Pounds of zinc paid for by smelter		538,318
Average zinc price		$5.86

Mining and milling have been carried on with but few minor interruptions, and the ore coming from the stopes on the 1,100 level is much higher in silver values than that which has heretofore been mined. The gold contained in this ore is sufficiently high to make it possible for the smelter to pay for it.

The present development campaign contemplates the sinking of two winzes, one on the Silversmith oreshoot and the other on the Slocan Star oreshoot. These winzes will be sunk as rapidly as possible, and when the station, cut at what will be the 1,500 level, is reached, crosscutting and drifting will be done on the vein to develop additional ore reserves.

The high-grade ore mined from the stopes on the 1,100 level, continuing at depth to the 1,500 level, should give ore reserves far in excess of any heretofore developed in the mine.

Mining Stocks—Week Ended January 9, 1926

Mining stock quotations for week ended Jan. 16 on following page

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Anaconda	New York	50⅜	49⅜	49¾	Ja.16,Fe.23,Q	0.75
Arcadian Consol.	Boston	*90	*70	*70		
Ariz. Com'l.	Boston	12¼	12	12½	Jy.21, Jy. 31 SA	0.50
Calaveras	N. Y. Curb	4	3⅞	3⅞		
Calumet & Arizona	New York	64½	62	64	De.4, De.21 QX	1.50
Calumet & Hecla	Boston	15½	13⅞	15	Nov.30,De.15 Q	0.50
Cerro de Pasco	New York	63½	61	61¾	Dc.10, De.22,X	1.00
Chile Copper	New York	36⅛	34⅛	35	Dec.2, Dec.28, Q	0.62½
Chino	New York	19⅛	19	19⅛	Sept., 1920	0.37½
Con. Coppermines	N. Y. Curb	2⅛	2	2		
Copper Range	Boston	20	18	19	May, 1925	1.00
Crystal Copper	Boston Curb	*56	*47	*48		
East Butte	Boston	3½	3½	3½	Dec., 1919	0.50
First National	Boston Curb	*20	*20	*20	Feb., 1919	0.15
Franklin	Boston	*55	*50	*51		
Granby Consol.	New York	22⅛	21	22¼	May, 1919	1.25
Greene-Cananea	New York	13⅛	12⅛	12¼	Nov., 1920	0.50
Hancock	Boston			*80		
HoweSound,new,r.t.c.	New York	28¼	27	27⅛	Oc.5, Oc. 15 Q	0.50
Inspiration Consl.	New York	25⅜	25	25	De.17, Ja.4, Q	0.50
Iron Cap	Boston Curb			2⅜	May, 1923	0.15
Isle Royale	Boston	12¼	11⅞	12⅛	No.30, De.5	1.00
Jerome Verde Dev.	N. Y. Curb	1	*91	1		
Kennecott	New York	57⅞	54⅝	56⅞	De.4,Jan.2 Q	1.00
Lake Copper	Boston	1¼	1¼	1¼	June, 1925	0.50
Magma Copper	New York	43¼	42½	43	De.31, Ja.15,	0.75
Mason Valley	N. Y. Curb	2	1⅞	2		
Mass Consolidated	Boston	*60	*60	*60	Nov., 1917	1.00
Miami Copper	New York	12⅜	12⅛	12¼	No.2, No.16 Q	0.25
Mohawk	Boston	35	33	33½	Oc.31, De.2	1.00
Mother Lode Coa.	New York	7¼	7	7¼	De. 11, De. 31	0.37½
Nevada Consol.	New York	13⅛	13⅛	13⅛	De. 18, De.31 Q	0.25
New Cornelia	Boston	20⅜	20	20½	No.6, No.23 Q	0.25
North Butte	Boston	3⅜	3⅛	3⅜	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	*70	*62	*70	No. 14, De. 2	0.05
Old Dominion	Boston	18½	17⅛	17⅛	Dec., 1918	1.00
Phelps Dodge	Open Mar.		†124		De.21, Ja.2 Q	1.00
Quincy	Boston	22⅛	20⅛	21	Mar., 1920	1.00
Ray Consolidated	New York	12⅛	11⅛	11⅞	Dec., 1920	0.25
Ray Hercules	N. Y. Curb			14		
St. Mary's Min. Ld.	Boston	36⅛	35	35⅜	May, 1925	3.00
Seneca Copper	New York	10⅛	9⅛	9⅜		
Shannon	Boston	*80	*65	*65	Nov., 1917	0.25
Shattuck Arizona	New York	69⅜	66⅜	67½	Jan.,,1920	0.25
Superior & Boston	Boston	*95	*90	*95		
Tenn. C. & C.	New York	14⅜	14⅛	14⅛	De.31, Ja.15,Q	0.25
United Verde Ex.	N. Y. Curb	27⅛	27⅛	27⅛	Ja.5, Fe.1, Q	0.75
Utah Copper	New York			98	De.18, De.31, Q	1.25
Utah Metal & T.	Boston	*70	*50	*50	Dec., 1917	0.30
Victoria	Boston			*35		
Walker Mining	Salt Lake	1.65	1.50	1.50		
NICKEL-COPPER						
Internat. Nickel	New York	46½	44½	44½	De.17,De.31,Q	0.50
Internat. Nickel, pfd.	New York			102⅜	Oc.15, No.2, Q	1.50
LEAD						
Gladstone M. M. Co.	Spokane	*34½	*33	*34½	No. 1, No. 10 M	0.0½
National Lead	New York	174½	167½	170⅛	De.11, De.31 Q	2.00
National Lead pfd.	New York	116½	116½	116½	Aug.21, Se.15	1.75
St. Joseph Lead	New York	46	44¼	45	De.10,De.20QX	1.50
ZINC						
Am. Z. L. & S	New York	10¼	8¾	9¼	May., 1920	1.00
Am. Z. L. & S, pfd.	New York	43	37⅜	42	Nov., 1920	1.50
Butte C. & Z.	New York	5⅞	5¼	5⅜	De.10, De.24	0.50
Butte & Superior	New York	16	14⅞	15½	De.15, De.31 Q	0.50
Callahan Zn-Ld	New York	2⅛	2	2⅛	Dec., 1920	0.50
Eagle Picher	Cincinnati			35⅛	De.1, De.31	0.40
Eagle Picher, pfd.	Cincinnati			110		
New Jersey Zn.	N. Y. Curb	209	207	208	No.20,Dec.10 X	2.00
United Zinc	N. Y. Curb			*70		
Yellow Pine	Los Angeles	*37½	*34	*34	Se.10 Se.21 Q	0.04
GOLD						
Alaska Juneau	New York	2	1¾	1¾		
Argonaut	Toronto	*23	*16	*22½		
Barry-Hollinger	Toronto	*26	*24¾	*25		
Carson Hill	Boston			*41		
Consol. W. Dome L.	Toronto	*24¾	*20	*24½		
Cresson Consol. G.	N. Y. Curb	2¾	2⅛	2⅛	Se.30, Oc.10	0.10
Crown Reserve	Toronto	*21½	*20	*20	Jan., 1917	0.05
Dome Mines	New York	16¾	16	16¾	De.31, Ja.20, Q	0.50
Golden Cycle	Colo. Springs	†1.59	†1.58		No. 30, Dec.10 Q	0.03
Hollinger Consol.	Toronto	18.50	17.40	18.40	De.14, De.31	0.08
Homestake Mining	New York	50	47½	49	De.19, De.26 M	0.50
Kirkland Lake	Toronto	*91	*86	*91		
Lake Shore	Toronto	10.00	9.60	9.90	De.1,De.15 XQ	0.10
McIntyre-Porcupine	New York	24⅜	22⅞	24	No.2, De.1 Q	0.25
Newray	Toronto	*45	*42	*42		
Night Hawk Pen.	Toronto	*10	*10	*10		
Portland	Colo. Springs	†*65	†*63½		Oct., 1920	0.01
Rand Mines	New York			33¾	Au.17, Au.25	1.52
Teck-Hughes	Toronto	2.99	2.71	2.98	Ja. 15, Fe. 1	0.05
Tom Reed	Los Angeles	*55	*55	*55	Dec., 1919	0.02
Tough-Oakes	Toronto	*56	*53	*54		
United Eastern	N. Y. Curb			*45	July, 1924	0.05
Vipond Cons.	Toronto	1.75	1.62	1.72		
Wright-Hargreaves	Toronto	8.05	7.80	8.00	De.15, Ja. 1 QX	0.10
GOLD AND SILVER						
Carnegie Metals	Pittsburgh			18⅝		
Con. Cortez	N. Y. Curb	*7	*6	*6		
Con. Virginia	San Francisco	*30	*24½	*24½		
Continental Mines	N. Y. Curb			*45		
Dolores Esperanza	N. Y. Curb	*84	*77	*84	July, 1923	0.05
Premier Gold	N. Y. Curb	2½	2½	2½	De.18, Ja. 4	0.08
Tonopah Belmont	N. Y. Curb	3⅜	2⅞	3	Se.15, Oc.1	0.05
Tonopah Extension	N. Y. Curb	1⅛	*94	*94	Apr. 1925	0.05
Tonopah Mining	N. Y. Curb	6⅛	5	6	Se.30, Oc.21	0.07½
Unity Gold	N. Y. Curb			*20		
West End Consol.	N. Y. Curb	*25	*25	*25	Mar., 1923	0.05
Yukon Gold	N. Y. Curb	*74	*50	*60	June, 1918	0.02

Stock	Exch.	High	Low	Last		Last Div.
SILVER						
Alvarado	N. Y. Curb			*76	Oct., 1920	0.50
Beaver Consol	Toronto			*50	May. 1920	0.03
Castle-Trethewey	Toronto	1.55	1.54	1.54		
Coniagas	Toronto	4.50	4.50	4.50	May, 1924	0.12½
Keeley	Toronto	1.68	1.64	1.65	Au.31,Se.15 X	0.12
Kerr Lake	N. Y. Curb	1	1	1	Oc. 1, Oc.15 Q	0.12½
La Rose	Toronto	*39	*36½	*38½	Apr., 1922	0.10½
Lorrain Trout Lake	Toronto	1.10	1.05	1.10	Jy. 2, Jy. 15	0.05
McKinley-Dar.-Sav.	Toronto	*23½	*21½	*22½	Oct., 1920	0.03
Mining Corp. Can.	Toronto	3.50	3.35	3.45	Ja. 16, Ja.30	0.12½
Nipissing	N. Y. Curb	7¼	6½	7¼	De.31, Ja.2, Q	0.15
Temiskaming	Toronto	*15¼	*14½	*15¼	Jan., 1920	0.40
SILVER-LEAD						
Ahumada	New York	9⅛	8¾	8⅞	De.15,Ja.2, X	0.25
Alta Merger	Salt Lake		†3			
Bingham Mines	Boston	55¾	53	53	De.19, De.20 Q	1.00
Cardiff M. & M.	Salt Lake			*55	De.16, No.18	0.10
Chief Consol.	Salt Lake	3.77½	3.77½	3.77½	Oc. 10, No. 1	0.10
Emma Silver	Salt Lake		†1			
Erupcion	Boston Curb	2	1⅜	1⅝	De.15, Ja.2, X	0.10
Federal M. & S.	New York	111½	99½	105	No.25, De.15 Q	1.75
Federal M. & S., pfd.	New York	105	99½	103½	Au.25, Se.15	1.75
Hecla Mining	N. Y. Curb	18	17⅞	18	No.15, De.15 Q	0.50
Iron King Mining	Salt Lake	*40	*36	*40		
Keystone Mining	Salt Lake	*62	*61	*62	Au.12, Au.26	0.07½
Lucky Jim	Spokane	*13¾	*12¼	*13¾		
Mammoth Mining	Salt Lake	3.00	3.00	3.00	De. 16, De. 23	0.10
Marsh Mines	Spokane	*14½	*10½	*14½	Se.15, Oc.1	0.15
Ontario Silver	New York	10½	10	10		
Park Utah	Salt Lake	7.90	7.65	7.85	Se.15, Oc.1	0.15
Prince Cons	Salt Lake	*9	*8½	*8½		
Silver King Coal	Salt Lake	9.85	9.70	9.75	De.15, Ja.2, QX	0.35
Silversmith	Spokane	*39½	*37	*39½	De.31, Ja.10	0.02
Tamarack-Custer	Spokane	*77	*35	*71	Sept., 1924	0.25
Tintic Standard	Salt Lake	13.25	13.00	13.00	De.16,De.23,QX	0.50
Utah-Apex	Boston	7¼	6	6⅛	Ja.1, Ja.5, Q	0.35
Western Utah Copper	N. Y. Curb			*10		
IRON						
Bethlehem Steel	New York	50¼	48	49	July, 1924	1.25
Colorado Fuel & Iron	New York	38	36½	36½	May, 1921	0.75
Gt. North'n Iron Ore	New York	26⅞	25⅞	26	De. 4, De. 28.	0.75
Inland Steel	New York	43½	42⅛	42½	No.13, De.1 Q	0.62½
Mesabi Iron	N. Y. Curb	2	1⅝	2		
Replogle Steel	New York	15⅞	14½	15		
Republic I. & S.	New York	63⅛	59⅝	62½	May, 1921	1.50
Republic I. & S. pfd.	New York	94½	93¾	93⅞	De.15, Ja.2, Q	1.75
Sloss-Sheffield S. & I.	New York	136½	134	134	De.10, De.21 Q	1.50
Sloss-Shef. S.&I. pfd.	New York			103	De.21, Ja.2, Q	1.75
U. S. Steel	New York	138⅛	135⅛	136¼	No.28, De.30 XQ	1.75
U. S. Steel pfd	New York	126¼	125⅛	126	No. 3, No. 28, Q	1.75
Virginia I. C. & C.	New York	42	42	42	Jan., 1924	1.50
Virginia I.C.&C.pfd	New York			77	De.15, Ja.2,	2.50
VANADIUM						
Vanadium Corp.	New York	32⅛	31⅛	31⅞	No.2, No.16 Q	0.50
ASBESTOS						
Asbestos Corp	Montreal	94½	92	94½	Se.30, Oc.15 Q	1.50
Asbestos Corp., pfd.	Montreal	116	113	116	Se.30, Oc.15, Q	1.50
SULPHUR						
Freeport Texas	New York	21⅛	19⅞	20	Nov., 1919	1.00
Texas Gulf	New York	124	121	122½	De.1, De.15,QX	2.75
DIAMONDS						
De Beers Consol.	New York	29	28	28	Jy.27, Au.30	0.97
PLATINUM						
So. Am. Gold & P.	N. Y. Curb	4⅛	4⅛	4⅛		
MINING, SMELTING, REFINING AND GENERAL						
Amer. Metal	New York	56	53⅛	55⅛	No. 20, De. 1, Q	1.00
Amer. Metal pfd.	New York	117	116½	117	No. 21, De. 1, Q	1.75
Amer. Sm. & Ref.	New York	144½	137½	141½	Oc.16, No.2, Q	1.75
Amer. Sm.&Ref.pfd.	New York	114½	113	114½	No.6, De.1, Q	1.75
Consol. M. & S.	N. Y. Curb	190	181	190	De.31, Ja.15	0.75
Federated Metals	N. Y. Curb			18		
Newmont Mining	N. Y. Curb	50¾	49½	50	De.31, Ja.15,	0.60
Southwest Metals	N. Y. Curb			2½		
U. S. Sm. R. & M.	New York	49¾	47½	48½	Ja.1, Ja.7, Q	0.87½
U.S. Sm. R.&M.pfd.	New York	50	49½	49½	Ja.1, Ja.7, Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange and George H. Watson & Co.; Colorado Springs, Colorado Springs Stock Exchange.

LONDON QUOTATIONS, WEEK ENDED JANUARY 2, 1926

	High	Low	Last	Date	Per Cent
Aramayo Mines (25 frs.)	81/3	80/—	80/—	Nov. 1925	5(c)
British Platinum	8/—	7/—	7/9	Feb. 1925	2½
Burma Corpn. (10 rupees)	19/3	18/6	18/10½	Feb. 1926	6 annas.*
Bwana M'Kubwa	8/—	7/9	7/10½		
Camp Bird	5/3	4/4½	4/7½		
El Oro	5/9	5/6	5/9	Nov. 1924	2½*
Esperanza	—/10	—/8½	—/9		
Frontino & Bolivia	8/1½	7/6	7/6	Jan. 1926	1½
Mexican Corporation	22/3	21/—	22/		
Mexican Mines of El Oro	31/10½	31/3	31/10½	Dec. 1925	12½*
Nechi (pref. 10s.)	1/6	1/—	1/6	1921-22	25
Oroville Dredging	4/1½	4/—	4/—	Dec. 1923	3¾
Ouro Preto	2/9	2/6	2/6	May 1925	2½
St. John del Rey	10/6	10/3	10/3	June 1925	6½
San Francisco Mines	29/3	28/6	28/9	Jan. 1926	22½
Santa Gertrudis	21/4½	20/6	21/3	July 1920	5
Selukwe (2s. 6d.)	12/6	11/6	12/4½	April 1917	6¾
S. American Copper	5/4½	4/9	5/3	Nov. 1917	75
Tanganyika	48/7½	45/—	47/6	Sept. 1925	5s.
Tomboy	4/6	4/3	4/6	Sept. 1925	5
Union Minière du Haut-Katanga (Brussels) 100 Fr.	6.750	6.600	6.700	July 1925	150(b)

* Free of British income tax. (b) Belgian francs. (c) Swiss francs.

Zinc Stocks Declined in December

By A. J. M. Sharpe

Foreign Correspondent, the American Zinc Institute

ZINC has maintained its reputation for presenting a constantly changing position, although in 1925 the market movement more closely followed the lines predicted than in preceding years. World production last year was the highest on record at 1,113,000 metric tons, but consumption also broke records and in 1925 actually exceeded output.

The new year opens with a strong market, albeit the London price is well below the parity of St. Louis. The basic reason for this is the expansion in United States consumption in the last quarter of 1925—a condition which not only counteracted the lessened exports but reduced American stocks to the lowest point for many years. Consumption in England as well as on the Continent was well maintained throughout the year, except in Germany, where the demand fell away in common with that for other metals in consequence of trade depression in that country since September. One wonders what would have happened to the markets had the German situation kept good: doubtless there would not have been enough metal to go round and Europe would have been more dependent than ever upon regular supplies of American slab zinc.

Prospects for 1926 may be summarized by the statement that the year is likely to be marked by more violent price fluctuations than usual. In Germany trade and industry are just about as bad as they can be, ice is hindering the transport of Silesian metal, and at the time of writing floods are disturbing operations in Belgium and Holland.

Generally speaking, the year just passed has been a profitable one for European smelters, thanks to the satisfactory market level which prevailed. Ore supply continues to govern the situation, and there are no further hopes of improvement in this direction than existed a year ago. It is true that Continental smelters have bought a moderate tonnage of concentrates on the Tri-State field, these purchases being actuated by the desire to keep plants more or less fully occupied rather than the hope of securing a treatment profit. The supply of ore available from Western America has exceeded expectations, but it is recognized that this avenue may be closed in eighteen months if the project to erect a domestic smelter is proceeded with.

The zinc rolling mills have enjoyed a good year, and English galvanizers at least have nothing to complain of. Continental rollers and English galvanizers alike are happily placed with orders for delivery over the first quarter of the new year.

High-grade zinc has readily sold at a satisfactory premium over the price of Prime Western, but I expect this spread to be narrowed in 1926 as a result of the greater production of electrolytic zinc at Anaconda and Trail.

Unless I am much mistaken the year which has just opened will be marked by important metallurgical changes, and it is surely not premature to introduce now improvements in smelting practice.

World stocks of zinc as at Jan. 1, 1926, are estimated at 26,150 metric tons compared with 29,200 on Dec. 1, 1925. The figures follow:

	Metric Tons		Metric Tons
United States	8,450	Scandinavia	200
Germany and Poland	10,400	Australia (including unsold shipments afloat)	2,000
Canada	1,200	Far East	500
Great Britain	300	Elsewhere	500
Belgium	1,800		
France	800		

Cresson Consolidated Ore Shipments Averaged $19 During Year

During the year ended Aug. 31, 1925, 112,068 dry tons of ore was shipped by the Cresson Consolidated Gold Mining & Milling Co., operating in the Cripple Creek district, in Colorado. The ore had a gross value of $2,139,725.09, averaging $19 per ton; returns, less transportation and treatment, were $1,474,619.57, giving the ore a net value of $13.15 per ton. The company received as additional income the sum of $21,102.22 interest on bank deposits, making a grand total of $1,495,721.79, with total expenses of $721,435.22, resulting in a net gain from operations of $774,286.57. The total cost per ton of ore produced was $6.43. This is an increase of $1.16 per ton over 1924. The entire cost was $6.43 per dry ton, resulting in a net profit of $6.91 per ton.

Total cash at the close of the fiscal year ending Aug. 31, 1925, was $1,288,991.26.

The total cost of mining is divided as follows:

General expense	$ .025
Taxes	.65
Insurance	.13
Salary officers	.08
Colorado Springs office	.095
Mining operations	5.45
	$6.43

The higher cost of producing ore is due to $7,000 increase in state and county taxes and $34,000 increase in federal taxes paid, which was due to absorbing during 1924 a surplus sum set aside for this tax. Actual mine expenses were increased by pumping costs, costs of operating at greater depth, and smaller tonnage. Broken ore reserves and physical condition of the mine are good. L. G. Carlton is general manager.

Income and Expense Account for Year Ended Aug. 31, 1925

Revenues		
Ore sales, company "net"		$1,474,619.57
Interest on bank balances		21,102.22
		$1,495,721.79
Expenses		
General expense		$2,848.25
State and county taxes		25,483.76
Federal taxes		47,895.64
Operating expense (mine)	$247,726.66	
Contracts (mine)	134,184.96	
Payroll (mine)	219,500.50	
Total mine expense		601,412.12
Insurance		14,585.78
Salaries of officers		8,800.00
Colorado Springs office		10,609.67
Mine management and engineering		9,800.00
Revenues in excess of expenses		774,286.57
		$1,495,721.79

Recent Auction Sales of Mining Stocks and Bonds

The following sales of stocks and bonds recently have been made. The amount specified is for the entire lot.

1,000 Copper Canyon Mining, par $1	$125
20,000 Volcano Mines, no stockholders' liability, par $1	$10
127 U. S. Radium Corporation, class A, common, no par	$10
200 U. S. Radium Corporation, class A, common, v.t.c., no par	$5
82,400 Eureka-Swansea Extension Mining Co., par 10c	25
202,254 Gold Reward Consolidated Gold M. & M., par $10	$1,000
40 Trinity Copper Corporation, par $5 200 First National Copper Co., par $5 500 Ely Copper Co., par $10 400 Cons. Nev.-Utah Corporation, par $3 $200 Consolidated Nev.-Utah Corporation convertible 6s, ctf., dep	$32
57,500 Hardshell Mining, par $1	$75
500 Butte-New York Copper	$16
500 Bullion Mining, Salt Lake City, Utah	$5
1,000 Rescue-Eula Mining, par $1	$5
90 Louisiana Consolidated Mining, par $1	$1
200 Guanajuato Mining & Milling, par $5	$6
200 Alaska Gold Mines Co., par $10	$2
700 Hedley Gold Mining Co., Ltd., par $10	$875
2,600 Twin Republic Mining Co., par $1	$50
$124,000 Imperial Copper Co. 6 per cent special contract mortgage registered bonds due July 1, 1918; $99,000 have installment coupons $50 each Nos. 1 to 20 attached; $25,000 have installment coupon $50 each Nos. 2 to 20 attached	$25
5,000 Oklahoma Oil Co., common, par $1 500 Marigold Mining Co., Ltd., par $1 303 Dakota Continental Copper Co., par $1 100 Black Prince Copper Co., par $1 10 Sonoma Magnesite Co., par $10 300 Allied Oil Corporation, par $1	$20
$21,479.59 demand note of the Manigotogan Mining & Development Co., Ltd., dated May 1, 1924	$110
1,100 Mack Copper Co., common, par $10	$55
40,000 Ely Nevada Copper, par $1	$11
2,000 Wyoming Gold Mining Co	$13
19,589 Santa Rosa Mining Co., common, par £1	$500
500 Kornkob Mining & Development, par $5	$2
1,000 Int. Tungsten Corporation, temporary certificates, par $10	$12
500 Int. Tungsten Corporation, par $10	$12
1,000 Cobalt-Lorrain Mining & Development, par $1	$2
6,050 Chontales Mines, Ltd., par $5	$310
$7,700 Tecolote Copper Corporation, collateral trust s.f. 8s, 1933, March 1925 coupons attached	$150
$5,000 Tecolote Copper Corporation collateral trust s.f. 8s, due 1933	$100
200 Bagdad-Chase G. M. Co., preferred, par $5, 100 Bagdad-Chase G. M. Co., common, par $5	$13
105 Boston & Ely Consolidated Mines, par $1 25 New England Casualty Co 100 Mexico Consolidated Mining & Smelting Co., par $10 2,000 Silver Leaf Mining Co., par $1 400 Raven Copper Co., par $1	$15
4,000 Alaska Copper Corporation, par $5	$4
$1,000 Alaska Copper Development Syndicate, participating certificates	$4
25,000 Alaska Gold Belt Co., and 50,000 shares bonus, par $1 2,500 Alaska Gold Belt Co. and 2,500 shares bonus, par $1	
100 Canada Copper Corporation, par $5	$1
500 Colorado Smelter & Mines Corporation, common, par $1	$125
$1,500 Midwest Butte Development Co., 6 per cent notes past due convertible into stock at par	$50
1,950 Union Copper Mining, par $1	$25
75 Smuggler Union Mining Co 600 French Flag Mining & Milling Co., par $10 1,417 Boston & Corbin Mining Co., par $5 10 Corbin Copper Co., par $25 1,500 Santa Rosa Mining, par $1	$50
125 Utah Consolidated Mining Co., par $5	$1
3,000 N. Y.-Bingham Mining Co., par 10c	$110
5,000 Central American Mines, Inc., par $1	$210
600 sub shares Colombian Emerald Syndicate, Ltd., par $25	$1